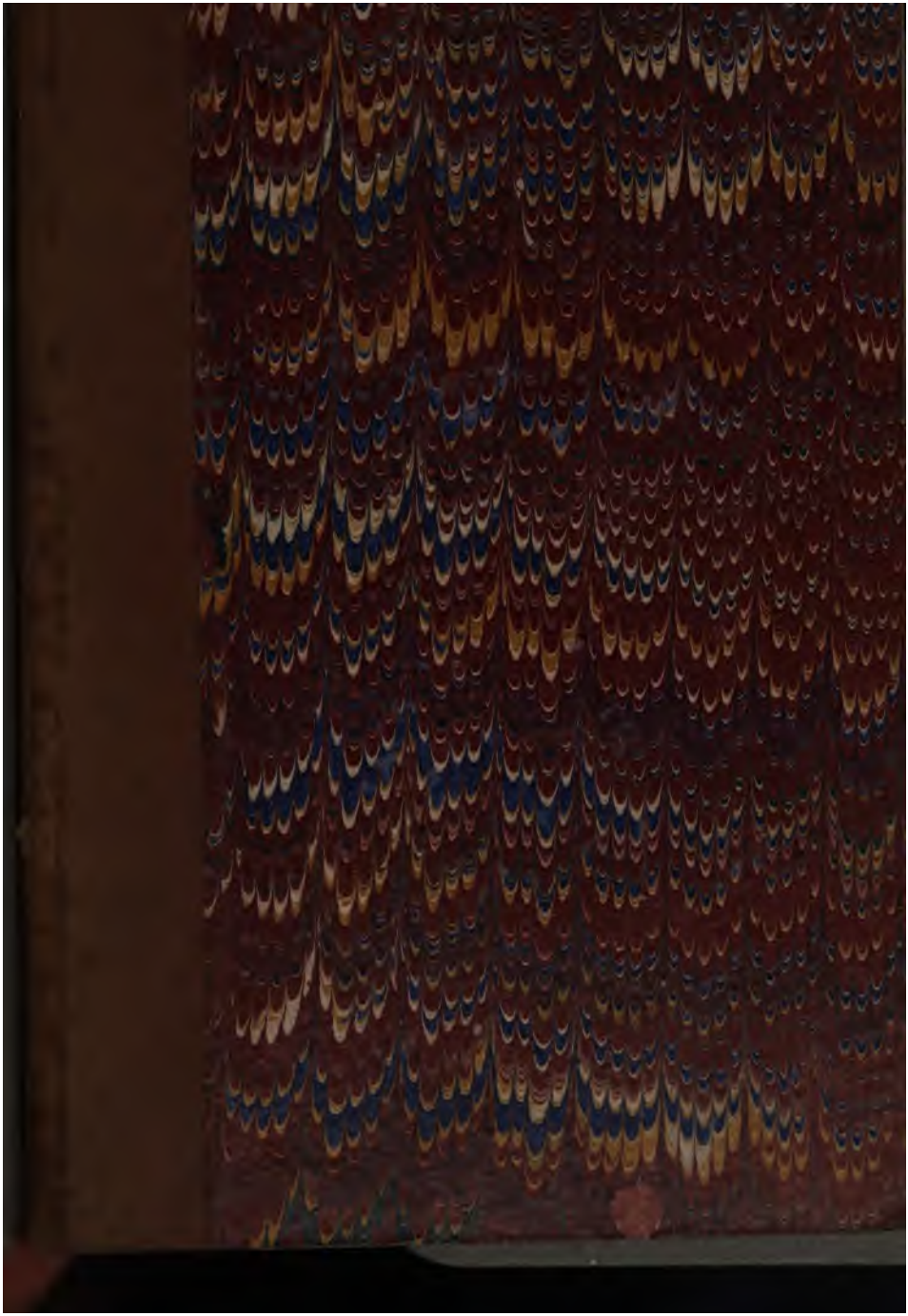

PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

STEERING AND MANŒUVRING VESSELS.

A.D. 1763–1866.

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PREFACE.

THE Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent, and be supplied in future editions.

This volume contains Abridgments of Specifications to the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological and Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

The principal inventions to which the present series relates may be classed under two heads; first, simply guiding the vessel's course; and second, giving a new direction to it by propelling apparatus of any description. The first head includes rudders, steering-paddles, &c., as well as means for operating the same. Under the second are comprised transverse screws, paddle-wheels, &c.; methods of turning the propeller from side to side, so as to cause it to act in a line at an angle with the line of the keel; means for driving paddle-wheels, &c., separately, so as to render them available for steering; the use of two or more screws or other propellers, jets of water, &c., and other similar inventions. In all these cases only that portion of the invention has been treated which refers to its use for steering and manœuvring; for descriptions of patented inventions dealing with the propulsion of vessels, reference must be made to the series of Abridgments entitled "Marine Propulsion."

In addition to the above it has seemed advisable to include in the series inventions treating of sliding keels and lee-boards. Though these are not actually steering

apparatus, yet their uses in manœuvring the vessel so nearly approach to those of the rudder itself, that it has been considered that their addition would render the series more complete.

It has not appeared necessary to refer to any of the numerous methods of signalling on board ship, even where such apparatus is specially used to convey signals to the helmsman. All these appliances are more fitly treated in one of the series specially dealing with the subject of signalling.

May, 1875. B. WOODCROFT.

INDEX OF NAMES.

[The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

INTRODUCTION.

SIMPLE as is the ordinary rudder, and obvious as its use might appear to be, there can be no question that it is quite a modern invention, at least in the form in which we now possess it. It may be difficult to believe that for many centuries no better contrivance than the clumsy and inconvenient one of side oars or paddles was in use for the purpose of steering vessels. Such, however, is certainly the case, for though, as will presently appear, some of the most ancient mariners approached very near to the idea of the modern rudder, by using a single large paddle, lashed to a support at the stern, it was not until the 14th century of our own era that the rudder as we now have it seems to have been known.

Under these circumstances there is not much of historical interest to be collected on this subject. M. Jal, in his two works on the subject,* has probably said all there is to say, and practically that comes to very little.

The method of steering employed in almost all ancient and mediæval vessels was by two large paddles, one on each quarter, though sometimes more were used, and in rare instances only a single one. It may be conjectured that the use of these paddles, specially intended for steering alone, was merely an improvement on the earlier method of steering the vessel by the oars, and it was probably some such invention that is attributed by Pliny† to Tiphys, the pilot of the Argo, the mythical vessel of the first Greek explorers of eastern lands. Such an origin would obviously account for the shape of the so-called rudder (πηδάλιον, *gubernaculum*) of ancient vessels.

Going back to the very earliest records of any civilization, the sculptured or painted monuments of Assyria and Egypt, we find the same steering paddles figured—more or less conventionally. All that can be gathered from the bas-reliefs of Nineveh seems to be that the larger vessels of such nations as were represented in the sculptures were steered by a pair of

* *Archéologie Navale*. *Paris*, 1840. *Glossaire Nautique*. *Paris*, 1848.
† Pliny, *Hist. Nat.*, vii. 57.

oars, longer and larger than those used for propulsion. The Egyptian records are more definite. The Nile boats represented by Sir Gardner Wilkinson* in his well-known work have some of them two paddles, some a single paddle. In many cases the short cross-handle, by the aid of which the unwieldy oar was manipulated, is shown, and in some a line appears to be connected to the loom, by which the oar may have been worked, though it must be allowed that it is not very easy to perceive the precise method of its use. In one instance † a Nile boat is represented in which there is a single paddle lashed to the stern and to a short post rising from the deck. With the addition of a tiller, this would practically have been an ordinary modern rudder, only shipped in a rather awkward way.

Much the same as these are the steering oars represented in numberless figures of Greek and Roman ships. On coins, in bas-reliefs, on vases, in the Pompeian paintings, we find them precisely the same. In rare instances there were more than two. The gigantic ship of Ptolemæus Philopator had four, each 30 cubits in length, if the traditional description of that remarkable vessel is to be believed.‡ The *νῆες ἀμφίπρυμνοι* § (ships with both ends alike) had rudders at both ends, as had also some mentioned by Tacitus as used by certain German tribes.‖ However, it appears from nearly all the representations of ancient galleys that are available, that the ordinary method of steering was by the two great oars on the quarters. Both of these were managed by a single helmsman (*κυβερνήτης*, *rector navis*), and they must therefore have been furnished with a short handle or lever by which they could be turned athwart ship, as each was required to be brought into action. When not in use they were probably allowed to lie close against the ship's side, so as to offer little resistance to the water. The exact manner in which they were supported does not appear to be precisely shown.¶

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* *Egyptian Antiquities.*

† Figured by Rosellini in his *Monumenti dell' Egitto.*

‡ Athenæus, v. p. 203, &c. § Soph., *Frag.*, 135.

‖ Tacitus, *Ann.*, ii, 6. "Adpositis utrimque gubernaculis;" and *Germ.* 44. "Utrimque prora paratam semper appulsui frontem agit."

¶ In the account of the shipwreck of St. Paul, in Acts xxvii., 40, reference is made to the *ζευκτήριαι* (rudder-bands, E.V.). These were doubtless the ropes with which the steering paddles were lashed to the sides when the vessel was at anchor, and which were let go when the paddles were to be brought into use.

Passing on in this hasty sketch to the vessels of mediæval times, we still see the same steering oars, differing not at all in principle and not much in shape and arrangement from those we have just considered. In the Bayeux tapestry, for instance, a galley thus fitted is represented, and the same occurs over and over again on coins and on the seals of nobles and of towns. It is indeed in one of the latter that the earliest known representation of the modern rudder occurs. Appended to a charter of A.D. 1328 is a corporate seal of the town of Damme, in Flanders, in which there is represented a ship with the ordinary modern rudder, pintles and gudgeons complete. From this it has been conjectured that the rudder is a Flemish invention, but beyond this nothing is known about it. The earliest coins on which it appears are stated to be the gold nobles struck by Edward III. after the battle off Sluys (A.D. 1340). That it did not come into use rapidly is evident from the fact that the steering oar appears commonly, even after we thus know the rudder to have been in use, and this makes it still more difficult to hazard a guess at the date of its introduction. It may have been in occasional use for many years before it was figured on the old Flemish seal, and yet not have made much way against the conservative instincts of sailors.

It is indeed possible that in the invention of the rudder we were forestalled by that curious people who have anticipated so many of our ideas, and yet have developed so few of them. Perhaps a search through old Chinese records might show that the artist who engraved the seal of Damme was not the first who pictured the rudder. For such an investigation the writer of this has had no opportunity, but as we find the rudder in use throughout China, and as we know that the Chinese are by no means a people to take up readily with new inventions, it seems almost safe to conclude that the rudder was in use in China long before it was known in Europe.

The rudder of the modern Chinese junk is a very curious appendage to the vessel, and in keeping with all the rest. It is of tremendous size. That of the Keying, the junk which visited the Thames in 1848, is stated to have weighed between 7½ and 8 tons. It was of iron-wood and teak bound with iron. It was arranged so that it could be let down in deep water, and raised when the water was shallow, and when down it hung 12 feet below the bottom of the vessel, the draught varying from

12 to 24 feet. To work it when down required 15 men with the aid of a tackle. When raised, it was worked by a short additional tiller. Instead of braces and pintles it was secured by ropes, two of which were led right forward under the vessel and brought in over the bows. The use of these was to hold the rudder to the stern. It was perforated with holes over the whole of the blade. The stern of the junk is generally hollowed out, so as to form a sort of chamber in which the rudder is hung. It is worked direct by ropes, without the use of a tiller.

The Japanese rudders, like those of the Chinese junks, are very large, so large as to become a positive source of danger to the vessel. They also are made to rise and fall. They are worked by a tiller which is sometimes a third of the length of the vessel itself.

In the shape or general arrangement of the rudder it is difficult to see any great alteration since its first introduction. The balance rudder is of course a modern invention*, and there have been such modifications of size and shape as suit the rudder to the lines of modern ships, but beyond this there appears no change, and the rudder now in use is practically identical with the oldest rudder known—that figured on the old seal above referred to.

In the manner of operating the rudder there have of course been many and great improvements. The first method adopted of applying more power than the ordinary tiller could give was the addition of a vertical lever, pivotted on a cross-bar on the upper deck, and connected to the end of the tiller on the deck below. This contrivance was in use till the end of the 17th century. About that time the steering-wheel with chains leading to a tiller is believed to have been introduced. Since then the improvements, proposed and adopted, in the methods of giving motion to the rudder in large vessels have been very numerous, as the abridgments in the following pages may serve to show. Last and most important of these come the different plans for working the rudder by power, either steam or more often hydraulic. By this means the rudder of such a large vessel as the Great Eastern† can be operated with as great ease

* See Subject-matter Index at the end of this volume, under head "Rudder Balance."

† The steering apparatus of this vessel is constructed on the system invented by Mr. MacFarlane Gray. *See* No. 3321, A.D. 1866, p. 227 of the present volume.

as that of the smallest boat. Perhaps the most recent example of this application may be found in the rudders of the Bessemer, a vessel whose flat bottom and comparatively light draught render an enormous amount of rudder power necessary.*

This substitution of engine for manual power has been rendered almost absolutely necessary, both from the increased size of modern ships, and from the substitution of steamers for the old sailing vessels. The latter, when properly trimmed and sailed, would almost "steer themselves," but in steamers the rudder alone has to control all the movements of the vessel, and this, especially in large steamers, necessarily requires a very large amount of motive power, more than can be readily supplied by manual force, to say nothing of the always advantageous economy of sailors on board ship by the employment of mechanical power in place of that of men. Of all systems of steering by power, the hydraulic seems the most in favour. When the steering is effected from the bridge, and it appears an admitted opinion that that is the proper position for the steering-wheel, the power required to convey the motion of the wheel to the rudder is very greatly increased by the unavoidable friction on the chains, &c., and it is only by using water as the transmitting medium that this drawback can be avoided.

Besides inventions of the classes above alluded to there are a good many intended to steer the vessel by other means. For an account of these reference must be made to the body of the book. It cannot be said that any of the devices have yet come into use, though there is one which is still a subject of discussion among naval constructors, and that is, the possibility of steering a vessel by means of a screw in the rudder.† Sometimes it is proposed to mount a small screw in the rudder and drive it by gearing from the propeller shaft; sometimes to mount the propelling screw in such a way that it can be turned from side to side. In both these methods the difficulty appears to lie in the necessary complication of gearing, and the danger

* This vessel, now (April 1875) just taking up her station as a Channel boat, is fitted with a rudder at each end, worked by hydraulic power, each rudder being manipulated by a short hand tiller. She is stated to draw about ten feet of water.

† For an account of one of the most recent of these, reference may be made to a paper read before the Institution of Naval Architects on March 26th, 1874, by Prof. V. Lutschaunig. See *Transactions* of the Institution, vol. xv. p. 97.

of entanglement from wreckage, &c. when thus working under water. Tempting as the problem is considered by those best competent to judge, it yet does not recommend itself to them as deserving serious experiment, so great are the apparent objections to it. Similar objections are raised against the different methods proposed for steering by screws or paddles acting transversely. The difficulties of driving a propeller in such a position, low down in the hull, and the objections to the use of toothed gearing under water are sufficient to outweigh the great advantages that would be afforded by any plan which would enable a vessel to be manœuvred and turned about without having any head-way on her.

STEERING AND MANŒUVRING VESSELS.

STEERING AND MANŒUVRING VESSELS.

A.D. 1763, March 3.—N° 785.

BURNE, CHARLES.—Dredgers.

Two vessels for dredging are described. One of these vessels is fitted with "lee boards through the keel to haul up or let "down in" "wells or cases for the lee boards which are to "make the vessel hold a good wind." No further description of these is given, but from the drawings they appear to be ordinary sliding keels. There are two of them figured, and each is raised and lowered by a couple of tackles.

[Printed, 10*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 132.]

A.D. 1779, April 22.—N° 1220.

JOLLY, THOMAS WILLIAM, and BEATTY, ROBERT.—"Ma- "chine for the steering of ships."

On the head of the rudder is fixed an arc of a circle which has, on either its exterior or its interior edge, a set of teeth which engage in a pinion on a spindle mounted parallel with the stern-post. On the top of this spindle is fitted a wheel, by which the rudder is worked. The toothed arc may be fitted either before or abaft the rudder as preferred. An index, worked by a cord round the spindle, may be used to show the position of the rudder. Instead of working the spindle direct by the wheel upon it, it may be turned by a vertical wheel connected with it by suitable gearing.

[Printed, 4*d*. No Drawings.]

A.D. 1789, December 12.—N° 1718.

DELOLME, JOHN LEWIS.—Ship-building.

A vessel of peculiar construction is described, in which the ballast is suspended on a long spar below the keel. It is fitted with an apparatus called in the Specification a "moveable

" cutwater," but, as appears from the Drawings, this is in reality a keel, hinged to the bottom of the vessel, and capable of being drawn to one side or the other by ropes affixed thereto for the purpose, so that it may always be kept in a position approximately vertical, however much the vessel may heel over. In going about, this swinging keel may also be drawn up so as to lie close against the bottom of the vessel. The rudder is fitted so as to hang below the bottom of the vessel and is supported below by a brace formed of two arms attached to the side of the vessel. To enable the rudder to be raised when required, these arms are pivotted to the side and to a bar on which the rudder is hung. To support the rudder when raised, a spindle is fitted in the stern, on which a projecting piece from the rudder-head slides.

There may also be a semi-circular iron segment fitted to the stern, within which the rudder may work. A latch carried by the rudder and worked by a rod connected to a lever on the rudder-head takes into one of a series of slots in the segment, the object apparently being to fix the rudder in any desired position.

On the rudder-head a cog-wheel may be fixed, and motion may be transmitted thereto from the tiller through a train of wheel-work so that the steering may be effected from any part of the vessel. An indicator on a hollow shaft surrounding the tiller shaft receives motion from the rudder so as to show its position.

[Printed, 1*s*. Drawings.]

A.D. 1790, March 13.—N° 1732.

STANHOPE, CHARLES, Earl.—Ship-building.

A vessel of peculiar construction is described, and also a special method of propelling it. An "equipollent rudder," for use with this or any other vessel, is described. In this the stock or axle is fixed in the centre of the rudder, which has thus two wings, one on each side. It can therefore be turned so as to lie right across the line of the keel, and thus serve to check the vessel's course. The stock is formed of a bar which works in eye-bolts on the stern-post, and has the ordinary steering apparatus connected to it. This rudder may be placed at the bows instead of at the stern.

[Printed, 1*s*. 6*d*. Drawing. *See* Rolls Chapel Reports, 6th Report, p. 182.]

A.D. 1792, December 20.—N° 1926.

COLLINS, WILLIAM. — "New kind of metal sheets and "fastnings for sheets intended for the sheathing ships, as also "the rudder furniture, commonly called ships' rudder braces "and pintles."

The Specification describes a method of smelting the copper ore. It then describes a method of making sheets and nails of copper, and finally proceeds as follows :—"The new-invented "or improved rother furniture, commonly called braces and "pintles, are made as follows, viz^{t} :— For the pintle, cast "pure copper in a loam dale, of the shape of the annexed "drawing," (that is to say T-shaped,) "and of a size and "weight proper for the pintle required. Heat it in an an-"nealing furnace, and draw it out by a forge hammer, as near "as may be to the length, breadth, and substance required. "The arms are from this operation still left in the same place "with the part intended to form the pintle. It must then be "taken to a smith's fire, and by hand hammering, chipping, "it is brought to the form required, both in substance and "bend, &c. The pintle part is to be particularly attended to, "and brought as near its length and diameter as may be by "chipping and hammering. It is then cut or drill'd down "by means of a tool which has a hole in it equal to the "diameter required, and with teeth on the end or face which "cuts off the irregularities of the metal, and prepares it to "receive a case or tube of hard metal of sufficient substance, "at the root of which is a base projecting horizontally from "the tube, about one and an half or one and three quarters "inches. A groove is cut in it, which is let into the copper "at the foot of the pintle (dovetailed ways), where it is beded "to about half an inch above the copper, which is forced into "the above groove by proper punches, and to make the case "prove secure the upper part or end of the copper pintle is "rivetted down over the edges of the brass tube. The ingot "for the brace is likewise cast of the purest copper in a loam "dale, of an oblong form, with a rising in the centre in form "or a segment of a circle, and of the same substance with the "ingots. It is then hammered, by means of the forge, to "the required form and substance, and it is then carried to "the smith's fire, and the hole to receive the hard metal brass

" or socket is punched, and the brace is turned to its proper " form and cut to its proper size. The brass socket with its " base is now fixed and fastened in like manner with the " pintle before described, and likewise rises with a shoulder " about half an inch above the copper, by which means the " brass tube of the pintle and the socket of the brace keep " the copper of the pintle and brace apart; and prevent the " friction."

[Printed, 8*d*. Drawing.]

A.D. 1796, May 3.—N° 2106.

MILLER, PATRICK.—Construction and propulsion of vessels.

A vessel for the conveyance of passengers is described. It is to be kept afloat "solely by the buoyancy of its bottom." " Sliders are used to work and keep the vessel to windward " when under sail. These sliders are placed in the centre of " the vessel from stern [*query* stem] to stern; they are made of plank, and the number and dimensions must depend on the length of the vessel; and they are raised and let down either by hand or by means of a purchase, according to the " size of the vessel."

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 6, p. 18.]

A.D. 1797, December 23.—N° 2206.

MILTON, WILLIAM.—Ship-building.

A "fish tail" may be added to the stern of any vessel. This appendage is of a somewhat conical form, or shaped like the hinder part of a fish. In it the rudder may be shipped, in the following manner:—Across the "fish tail" is a transverse slot, extending at top from side to side, but tapering below; in this a spindle is fitted which carries at its end a rudder. This spindle is fitted in bearings below, but above it is free to slide from end to end of the slot, being supported by pieces which rest on an arch over the slot. By this means it can always be kept vertical when the ship is heeling over, by the aid of a purchase. The rudder is thus always entirely submerged. More than one rudder may be employed. The whole apparatus may be fitted in a frame, and let down into an aperture in the "fish tail" so as to be moveable.

[Printed, 6*d*. Drawing.]

A.D. 1799, November 4.—N° 2349.

LONSDALE, WILLIAM.—Weighing anchors, steering, reefing sails, &c.

For steering, there is "one machine" "having two segments, "each something more than one quarter of a circle, firmly "fixed upon the rudder head," "one segment being before "and the other behind the rudder, one being inverted, having "each two rows or sets of cogs or teeth, and one spindle or "axis, which passes over one and under the other segment "fore and aft, on which two double pinions that engage the "cogs in the two segments and act in conformity with each "other. The spindle or axis passes thro' two head-stocks, "they being placed between two paralel standards, one before "and the other behind the rudder's head, so that the rudder "can rise or fall on the ship's striking or taking the ground." "By a vertical wheel put on the end of the spindle, either "before or abaft the rudder head" the vessel is steered. Also there may be only a single segment, which may be actuated as above or by an endless screw. "Ships whose rudder heads "do not come above the uppermost deck may by the addition "of one or more small wheels be steered upon the main or "quarter deck, &c."

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 6th Report, p. 196.]

A.D. 1800, February 4.—N° 2371.

SHORTER, EDWARD.—Machine for propelling vessels.

1. Methods are described of propelling vessels by boards at the end of beams to which a reciprocating or dipping motion is given by cranks or otherwise.

2. A method of propulsion is described. This consists of a "perpetual sculling machine having two blades or more, similar "to the sails of a windmill set in the same angular direction," on a horizontal shaft passing through the stern of the vessel, and having on it a universal joint outside the vessel. Its outer end is supported by a line attached to a buoy. It is revolved by a band over a pulley. The power used may be manual, animal, or that of a "steam or vapour engine." Two lines are attached to the shaft near its outer end, and by these it may be drawn to either side, so as to steer as well as propel the vessel.

3. "A propellor of a barge" "is so constructed as to "have the effect of a rudder by means of a pinion being placed "on the axis of a paddle, and a lever with a rack so situated "on the stern as to act in the pinion. The lever being moved "like a tiller, will put the paddle at an angle." The paddle may also be used by having a rope on each side, by hauling on either of which it may be caused to steer the vessel. It does not easily appear from this description how this paddle is to be used for propulsion. Probably it is to be driven by a crank on the shaft of a pulley rotated by a band as above.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 5 (*enlarged series*), p. 173, also vol. 14 (*enlarged series*), p. 241; Bourne on the Screw Propellor, p. 12.]

A.D. 1801, June 23.—N° 2519.

BOLTON, WILLIAM.—Rudder.

The rudder is fitted in the ordinary way to a bar which slides in bearings on the stern-post. By means of a screw or other power this bar with the rudder can be raised. The rudder may also be enlarged at will by having an additional piece which slides in a deep groove within the rudder so that it can be expanded or collapsed like a fan. This additional piece is pivotted at the top of the blade of the rudder and is raised or let fall by means of a toothed sector on its upper part which engages with an endless screw.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 16, p. 152.]

A.D. 1806, August 30.—N° 2964.

WILSON, CHRISTOPHER.—"Naval architecture."

A "cod smack" on an improved construction is figured. It has an "improved rudder," figured but not described. It appears to be divided down the centre in a horizontal line, and the forward portion is cut away in parts to give space for the braces into which the pintles fit, these latter being fitted on the after part.

[Printed, 1*s*. 8*d*. Drawings. *See* Rolls Chapel Reports, 7th Report, p. 192.]

A.D. 1806, September 6.—N° 2965.

NEWMAN, ROBERT.—Ships, barges, &c.

Instead of one rudder placed amidships, two rudders are used placed at the stern one on each side of the centre line and

at any distance from it. The nearer they are to the side, and the further from the line of the keel, the smaller are the rudders required. They may be worked simultaneously by one wheel or otherwise. By placing them athwartships, they serve to check the course of the vessel. They are specially adapted for barges.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 10 (*second series*), p. 83.]

A.D. 1806, October 15.—N° 2976.

GOVER, WILLIAM GLEGG.—"Wheel or purchase for the "steering of ships."

The tiller ropes are wound on a barrel, and on the axle of this barrel is a pinion into the teeth of which a cog-wheel engages. This pinion has preferably six teeth. Another pinion engages with the teeth of the wheel, and on its axle is the steering wheel. This pinion is formed preferably of three bars fixed between two discs, so as to be open in the centre. If preferred, the wheel may be fixed on the barrel itself, and the intermediate pinion dispensed with. The whole apparatus is fitted in a frame, so that the barrel, &c. can be removed.

[Printed, 10*d*. Drawing. *See* Rolls Chapel Reports, 7th Report, p. 193.]

A.D. 1807, February 16.—N° 3011.

STANHOPE, CHARLES, Earl.—Ship-building.

Amongst other matters, the Specification describes a sort of rudder, termed a "gill." These "gills" consist of thin plates of metal, and are hinged to a bar fixed along the side of a ship below the water line. Any number of them may be used, and there may be more than one row. They are actuated each by a bar, by which it is raised so as to hold the water. This bar passes through a stuffing box, or other means are employed for rendering the aperture water-tight through which it passes.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 12 (*second series*) p. 1; Rolls Chapel Reports, 7th Report, p. 196.]

A.D. 1807, March 20.—N° 3022.

DAY, JOHN.—Applying friction boxes to machinery.

The invention is applicable among other purposes to steering-wheels. The tiller ropes are wound on a barrel, on which

is a cog-wheel. An endless screw engages in the teeth of the wheel and drives it. The screw is turned by winch handles on it. The improved friction boxes are to be applied to the axles of the apparatus. The box is sufficiently large to allow the shaft to pass through it, and to contain a number of loose metal balls which surround the shaft and support it so as to lessen the friction.

[Printed, 10*d*. Drawings. *See* Rolls Chapel Reports, 7th Report, p. 196.]

A.D. 1811, May 1.—N° 3442.

DOBSON, JOHN.—"Rudder bands and bolts."

The following is the entire Specification. "Instead of "manufacturing rudder bands in the usual way, I first pre- "pare or make each part of them of wrought iron, or of any "other proper metal, which I suspend in the centre of the "mould in which they are usually cast. I then cast or pour "over them copper or any other metal or composition of "metal that will answer the purpose, in a melted or fluid "state, so that the iron or other metal bands shall become "sufficiently cased or covered with the copper or other metal. "Secondly, for bolts, I prepare or make a pin of wrought- "iron, which I also suspend in the centre of its mould; I "then cast or pour over the copper or other fit metal or com- "position in a melted or fluid state, until it likewise becomes "cased or covered; and in the same manner I treat every "other article which I case with copper or other metal or "composition. But in order to cause the two metals inti- "mately to unite, it will be necessary to heat the iron, &c. "red hot, previously to suspending or placing it in the "mould."

[Printed, 4*d*. No Drawings. *See* Rolls Chapel Reports, 8th Report, p. 86.]

A.D. 1811, July 19.—N° 3465.

TROTTER, JOHN.—"Application of steam and other powers "to useful purposes."

Water is pumped by means of a force pump into a series of chambers fitted with valves, and passes from the last of these chambers through an outlet pipe so that it may propel the vessel by reaction against the surrounding water. It is stated that the vessel can be steered by altering the position of the

discharge pipe, but no method for effecting this is described. "If the direction and situation of the said apertures [inlet "and outlet] a rotatory motion similar to that produced by "the rudder may be caused."

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 20 (*second series*), p. 136; Rolls Chapel Reports, 8th Report, p. 85.]

A.D. 1812, January 23.—N° 3525.

ROWLAND, RICHARD.—"Ships' steering wheels, compasses "and binnacles."

The principal improvements relate to binnacles and compasses. The only part relating to the steering-wheel runs as follows:—"The improvement of the steering-wheel is an "alteration of its position from athwart ship to fore and aft, "being a position better adapted to my improved binnacle."

[Printed, 8*d*. Drawing. *See* Rolls Chapel Reports, 8th Report, p. 88.]

A.D. 1814, August 4.—N° 3830.

THOMPSON, JAMES.—Steering, &c.

The side of the rudder is increased by a "dead water releiving "piece" which can be shipped on the rudder. It slides in a groove in the edge of the rudder and is attached by braces, the upper one of which turns up on a pivot, to allow the additional piece to be removed. It can be let down into position by ropes which are unreeved as soon as it is fixed. When required a still larger piece, called a "steering paddle," can be shipped instead of the smaller one. This has springs to fix it to the rudder, and a pair of jaws which fit over the rudder.

The stern-post and the edge of the rudder may be bevelled off to allow a greater play to the rudder. Chocks of metal may be bolted to the rudder and stern-post "to support the twist "of the gudgeon."

A rowing paddle is also described.

[Printed, 6*d*. Drawing.]

A.D. 1815, February 28.—N° 3888.

BROWN, SAMUEL.—"Rudder, and certain apparatus connected "therewith, for governing ships and vessels of all descriptions "with much more certainty and effect."

[No Specification enrolled.]

A.D. 1816, February 1.—N° 3977.

MILLINGTON, JOHN.—Propelling vessels.

Upon a shaft turning under water at the head or stern of a vessel "are fixed one, two, or more vanes or sails of plate iron, "copper, or other materials, with sufficient ribs or braces of "iron capable of making them stiff, and capable of main- "taining the form which may be given to them. These ribs "are placed in an angle of 45 degrees to the plane of their "motion, which lies at right angles or perpendicular to the "axis of the bar, so that when the bar is turned round upon "this axis it likewise moves the vanes in the manner of the "fly of a smoke-jack." The vanes have "spaces between them "like the sails of a windmill," and two vanes, "each ex- "tending to about the quadrant of a circle," are preferred. On the end of the shaft is a universal joint, by which it is connected to a short shaft, rotated by suitable means from a motive power engine. The propeller shaft is kept at a proper depth by guy ropes, fixed by a shoulder and collar on the end of the shaft. One of these ropes is attached to each side of the vessel, and by them the position of the propeller may be adjusted so as to steer the vessel. According to another method of propulsion, pipes are laid on each side of a vessel, outside or in, underneath the water, having their "open ends at or "near the stern on the two opposite ends of the rudder," or pointing towards the stern, and air is forced through them into and against the water to propel the vessel. It is not stated that these jets may be used to direct the vessel's course.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 5 (*enlarged series*) pp. 117 and 174; Rolls Chapel Reports, 8th Report, p. 112.]

A.D. 1816, March 14.—N° 3996.

DAWSON, JAMES.—Propelling vessels, &c.

An "elastic lever or oar" is described, among other matters, which may be used for propelling and steering vessels. The "handle" or shaft is of "any suitable elastic substance," "such as wood, whalebone, or steel." The blade is formed of a fork of the handle part, between the jaws of which is stretched a suitable elastic material, canvas, leather, &c., which may be strengthened by a series of rods. The blade may be made separate or in one piece with the loom, and in any other

way besides that above described, so that it is more or less flexible. "Elastic planes" may also be fitted to the loom above the blade. Also the "handle" may be "formed in "imitation of the back bone of a fish, with a vertebral action."

[Printed, 6*d*. Drawing. *See* Rolls Chapel Reports, 8th Report, p. 113.]

A.D. 1819, March 4.—N° 4345.

JEFFRAY, JAMES.—Propelling ships, &c.

Various modifications of a pump for hydro-propulsion are described. It is to be driven by any suitable prime mover. For steering purposes the main ejection pipe may have branch pipes connected thereto, with a valve at the point of junction, by means of which the stream may be directed into any of the branch pipes and discharged at any part of the ship.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 37 (*second series*), p. 151; London Journal (*Newton's*), vol. 1, p. 99; Rolls Chapel Reports, 8th Report, p. 131.]

A.D. 1820, April 19.—N° 4450.

LILLEY, GEORGE, and FRASER, JAMES BRISTOW. — Propulsion of vessels.

Water is driven by a force pump into an air-tight cistern, into which air is also forced by a condensing pump. From this cistern a pipe leads to any suitable part of the vessel where it discharges the water to propel the vessel. Steering is effected by means of branch pipes from the main pipe, these being fitted with cocks, by opening and closing with the manœuvring of the vessel is performed.

Two modifications of the apparatus are described, but the above is the only steering arrangement alluded to.

[Printed, 1*s*. 2*d*. Drawing. *See* London Journal (*Newton's*), vol. 2. p. 101.]

A.D. 1820, November 1.—N° 4505.

PEARSON, THOMPSON.—Rudders.

The "invention doth consist in a plunger or sliding end, "applied to the lower extremity of a ship's rudder in such "manner that when forced upwards by any power from "underneath it may rise without unshipping the rudder, and "may again be placed in its former situation from the deck." This "plunger" is a "hollow case" which slides over the end of the rudder, and forms the end of it. Fixed to the

" plunger " are rods which are carried up along the rudder to the deck, and by them the "plunger" can be raised or let down. Metal plates are fixed on the rudder for the "plunger" to slide upon. It has a gudgeon which slides on a pintle on the stern-post, and a guard to prevent its slipping off. On its bottom is a small roller. A "small tackle fall" is arranged to raise, and another to depress, the "plunger."

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 40 (*second series*), p. 71; London Journal (*Newton's*), vol. 2, p. 94.]

A.D. 1820, December 22.—N° 4520.

TIMBRELL, ANDREW.—Rudder.

The " invention doth consist in a flap or shutter applied to " each side of the stern-post or other after part of a vessel, in " such manner as to fall over against the rudder and cover the " spaces between the fore part of the rudder and the after " part of the stern-post (occasioned by the pintles and " gudgeons on which rudder is hung), for the purpose of " preventing the action of the water against the fore part of " the rudder when the vessel is moving forward."

The shutter has fixed along its length by means of braces a long bolt on which are pintles. These pintles take into gudgeons on the stern-post. On the top of the bolt is a ring, by which the shutter may be unshipped.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 45 (*second series*), p. 12; London Journal (*Newton's*), vol. 2, p. 175; Register of Arts and Sciences, vol. 1, p. 287.]

A.D. 1823, June 26.—N° 4806.

WILLOUGHBY, MONCRIEFFE.—" Construction of vessels."

The invention relates to the application of a " shifting ballast " keel moving up and down by suspenders through water-tight " grooves running perpendicularly right through the centre of " the hull of a flat-bottomed vessel." This keel is preferably of iron, and may be raised and lowered in any suitable manner, as by a rack, and either by hand or power. Several different shapes for the keel, &c., are figured in the drawing. In all the keel extends about the whole length of the vessel, and is rounded off at the ends. The "suspenders" are "sharp fore " and aft" and rather broad. The keels "might also be " strengthened by means of four flat iron guys attached to

"each of them and running diagonally from the keels, two on "each side to the larboard and starboard of the vessel." "These guys must be also constructed partly of joints so as "to fit the sides of the vessel, as well as for the purpose of "being flexible and yielding when the keel is to be drawn up." The rudder may be made with a sliding piece having a pintle working in the end of the keel, or may be "a little deeper than "usual." Lee-boards may be attached to the guys, or these themselves may be of sufficient breadth to act as lee-boards.

[Printed, 8*d*. Drawing. *See* London Journal (*Newton's*), vol. 7, p. 193; Register of Arts and Sciences, vol. 1, pp. 217, 247, 330, and 345; and Engineers' and Mechanics' Encyclopœdia, vol. 1, p. 190.]

A.D. 1824, July 13.—N° 4988.

PHILLIPS, CHARLES.—"Tillers and steering wheels."

On the top of the rudder-stock is fixed a horizontal wheel, preferably of cast iron. A "thin elastic strap" of iron is bolted to a beam beside the wheel, bends round the wheel, and is fixed to a lever on the other side. By means of this lever the strap can be tightened upon the wheel, so as to act as a friction brake. The lever is actuated by a cord carried over pulleys to a point near the steering-wheel.

Two methods of actuating the rudder are described. In one a short tiller is used, and the tiller ropes are led over a barrel concentric with, but not on the same axle as the steering-wheel. On the axle of this wheel is a pinion which gears on opposite sides with two pinions set eccentrically on the end of the barrel; these again gear into internal teeth on a fixed wheel. Motion is thus given by the steering-wheel to the barrel. The barrel is not circular, but eccentric, that it may accommodate itself to the varying length of the chain caused by the end of the tiller being at different points in the arc in which it moves.

In second plan a wheel is fixed over the rudder-stock, but not on it. In this wheel there is an eccentric groove, in which a pin on the tiller slides, and the groove is shaped so that as the wheel is revolved the tiller is carried from side to side. The wheel is worked by tiller ropes in the usual way, and the brake above described may be applied to it.

[Printed, 1*s*. 2*d*. Drawings. *See* Repertory of Arts, vol. 1 (*third series*), p. 476; London Journal (*Newton's*), vol. 11, p. 121.]

A.D. 1825, January 11.—N° 5078.

BURNETT, WILLIAM SHELTON. — "Lessening the drift of "ships at sea."

A "resisting float or floating lee board" is "so arranged "that when a ship or other vessel is fastened to it at sea, it "will offer a resistance to her leeway," and serve for her to ride by. This float consists of a plank of wood to which is affixed a square frame of iron rods. Canvas is stretched over the frame, and a bridle is attached to the corners, so that a cable from the vessel may be connected therewith. The float remains in the water with the frame downwards, and the square of canvas thus acts as a drag. The whole may be made to fold together, the beam being in several parts hinged together and furnished with bolts, by which it is kept extended. Lines may be carried from the ends of the beam to the vessel "for the "purpose of keeping the apparatus in a proper direction with "the vessel."

[Printed, 10*d*. Drawings. *See* Repertory of Arts, vol. 1 (*third series*), p. 277; London Journal (*Newton's*), vol. 12, p. 189; Mechanics' Magazine, vol. 5, p. 14; Register of Arts and Sciences, vol. 4, p. 273, also vol. 3, p. 135; Engineers' and Mechanics' Encyclopædia, vol. 1, p. 287.]

A.D. 1828, April 3.—N° 5637.

HARSLEBEN, CHARLES.—"Machinery to be used in navi-"gation."

Among other improvements is a "head rudder," to be fitted to the stem in the same way as a rudder is usually fitted to the stern, and used in conjunction with the ordinary stern rudder. As figured in the drawing, this rudder is fitted with a tiller projecting forwards, and worked by means of a tackle on each side. There is also a tackle connected to the bowsprit and the end of the tiller.

[Printed, 10*d*. Drawing. *See* Repertory of Arts, vol. 3 (*third series*), p. 85; London Journal (*Newton's*), vol. 5 (*second series*), p. 31.]

A.D. 1828, December 10.—N° 5730.

CUMMEROW, CHARLES.—(*A communication.*)—Propelling vessels.

Vessels are propelled by a "spiral" (from the drawings a screw with one complete turn) on a horizontal axis at the stern. *The end of the* stern-post is supported on a long spur from

the keel, and the rudder is attached in the usual manner. Two rudders, one on each side of the vessel, may be used. Two boats may be secured together by a wooden framing, and the "spiral" may work in the space between them. As shown in one of the figures, it is placed between the two bows. "The "boats may be also directed with a spiral between them" "in "causing the pivot of the spiral to turn to the right or to the "left."

[Printed, 8*d*. Drawings. *See* London Journal (*Newton's*), vol. 8 (*second series*), p. 144; Repertory of Arts, vol. 14 (*enlarged series*), p. 242.]

A.D. 1829, February 3.—N° 5765.

PUMPHREY, JULIUS. — Steam engines, propulsion of vessels, &c.

One portion of the invention relates to propelling vessels by the use of "spirals or screws." Of these there may be two, one on each side of the rudder at the stern. These are fitted in a frame "hung to turn in concert with the rudder." The shafts of the screws are fitted with universal joints. The patentee also proposes to employ "one or two spirals in a "waterproof case inside the boat in the line of its length, "and introduce the water by large openings at the sides." "The water is thrown out at the stern." The rudder is hung "in the center of the opening at the stern; it may be round, "square, or almost any regular figure." It is hung "at or "near its vertical centre," and has "both front and back a "sharp cutting edge."

[Printed, 10*d*. Drawings. *See* London Journal (*Newton's*), vol. 4 (*second series*), p. 328.]

A.D. 1829, April 14.—N° 5781.

LIHOU, JOHN.—"Ships' pintles."

The pintles "are of two kinds, which may be distinguished" as "live or hanging pintles, and dumb or bearing or friction "pintles." The hanging pintles are of the usual form, but the pin is separate from the boss, and the boss is drilled to receive it, the hole being of such a shape as to prevent the pin turning round or falling out. To prevent its rising the pintle is countersunk into the wood of the rudder. It works in *the usual gudgeons*. The dumb pintles are made on the

same principle, but have a "bearing stud" instead of a pin. The stud is introduced from below, and secured by a cross pin, by a screw or otherwise. These pintles work in "inverted" pintles with hollow faces.

[Printed, 4*d*. No Drawings. *See* Repertory of Arts, vol. 8 (*third series*), p. 593; also vol. 9 (*third series*), p. 16; London Journal (*Newton's*), vol. 4 (*second series*), p. 64; Register of Arts and Sciences, vol. 4, (*new series*), p. 125.]

A.D. 1830, February 27.—N° 5911.

SIEVIER, Robert William. — "Rudders for navigating "vessels."

[No Specification enrolled.]

A.D. 1830, November 1.—N° 6023.

COLLINGE, John.—"Apparatus used for hanging or sus- "pending the rudders of ships."

The improved apparatus is intended to replace the usual pintles. A boss is fastened by straps to the rudder in the usual way. A stud on the bottom of this terminates in a ball. To the stern-post a corresponding boss is fitted, in which a cup is hollowed which exactly fits the ball. Both ball and cup are case-hardened, and suitable apertures closed by screws are provided through which oil can be supplied. A leather washer fits round the top of the cup, and the lower side of the upper boss is shaped so as to fit close over the cup.

The rudder is preferably supported by one of these apparatus, near the top, and is held below by pintles of the usual sort but without "bearings on their shoulders." In hanging the rudder all the weight is to be received by the apparatus, the pintles only serving as hinges, and not sustaining any weight.

[Printed, 8*d*. Drawing. *See* London Journal (*Newton's*), vol. 8, (*conjoined series*), p. 422; Register of Arts and Sciences, vol. 2 (*new series*), p. 76.]

A.D. 1831, January 22.—N° 6063.

SMITH, Andrew.—"Propelling boats and other vessels."

A vessel is propelled by means of paddle-wheels which work in a chamber at the stern. It is steered by two rudders, one on each side of the stern. These rudders are connected together, and worked by a single tiller.

The remainder of the Specification does not refer to the present series.

[Printed, 1*s*. Drawings. *See* London Journal (*Newton's*), vol. 7 (*second series*), p. 305; Register of Arts and Sciences, vol. 6 (*new series*), p. 167; Rolls Chapel Reports, 7th Report, p. 134.]

A.D. 1831, March 21.—N° 6094.

PEEKE, WILLIAM, and HAMMICK, THOMAS. — "Rudder "hangings and rudders."

The object of the invention is to allow the rudder to rise and fall on touching the ground, &c. without being unshipped. The edge of the rudder is rounded off and the stern-post hollowed out to fit it. At the back of the groove in the stern-post another groove is cut, and this is faced with strips of metal so that T pieces may slide therein. These sliding pieces carry eye-bolts on their stems. At intervals across the groove stops are fixed, on which the sliding pieces rest, and a little distance above each stop the metal is cut away to permit the introduction of the sliding pieces. These openings are at various heights above the stops, so that when the sliding pieces are fixed to the rudder they may not all disengage at once when raised to the same height. At corresponding intervals along the edge of the rudder, similar eye-bolts are let into the wood flush with the edge, and the wood below is cut away to admit of the insertion of the eye-bolt on the sliding piece. An aperture is also cut in the wood above, through which a bolt may be dropped through both eyes, to hold them together. The bolt is then secured by a wooden plug.

In order to work the rudder when it is raised out of its usual place, the tiller may actuate it "by a segment rack "working in a long pinion or fluted cylinder."

[Printed, 6*d*. Drawing. *See* London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 134; Register of Arts and Sciences, vol. 6 (*new series*), p. 225; Rolls Chapel Reports, 7th Report, p. 135.]

A.D. 1831, November 19.—N° 6191.

HOLDSWORTH, ARTHUR HOWE.—Rudders.

The object of the invention is to permit the rudder to make an entire circle on its axis. For this purpose the rudder-stock is vertical, and the stern-post has sufficient rake to admit of the required revolution. The rudder has no pintles, but is supported by its heel resting on a projection from the keel

in which is a socket fitting a pin on the rudder. Immediately above the blade is a collar surrounding the stock and fixed to the stern-post. Another collar is bolted to the deck and through this the rudder-head passes and is secured above it by a pin and washers. The rudder may be worked in any way which will permit it to make an entire revolution. Thus a loose socket may be fitted on a pin at the end of the tiller, and the tiller ropes attached thereto; or a toothed wheel may be fixed on the rudder-head, and a pinion on a shaft moved by the tiller take into its teeth.

One principal object of the rudder being thus capable of revolution, is that when the ship is making stern way, the rudder may be turned round and always present its proper edge or bearding to the water. A rudder of this sort may be fitted to the stem, as well as the stern, of a vessel.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 14 (*third series*), p. 4; London Journal (*Newton's*), vol. 1 (*conjoined series*), p. 242; Mechanics' Magazine, vol. 17, p. 161; Register of Arts and Sciences, vol. 7 (*new series*), p. 161.]

A.D. 1834, August 23.—N° 6665.

RAPSON, JOHN.—"Facilitating the steering of vessels."

Two arrangements are described for working the tillers of vessels. In the first an endless screw on the axle of the steering-wheel engages with a pinion on a vertical shaft carrying a drum on which the tiller ropes are wound. Or, instead of the screw and pinion, wheels "with diagonal cogs" are used in the same position.

In the second method, a screw is formed on the shaft carrying a steering-wheel; a pinion on the end of this shaft gives motion to another pinion on the end of a similar screwed shaft, parallel to the first and beside it. On each of these screws works a nut, and each nut is joined by a connecting rod to an arm on the rudder-head. As the steering-wheel is turned, the nuts are caused to travel in opposite directions, and motion is thus imparted through the connecting rods to the rudder.

[Printed, 10*d*. Drawings. *See* Mechanics' Magazine, vol. 24, p. 449; London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 374.]

A.D. 1835, August 26.—N° 6892.

HIGGINS, JOHN LANE.—Ship-building.

A vessel is described in which are two "wheels" or discs sliding "in narrow trunks" "in the middle line of the vessel,"

one abaft the other. These "are to answer the purpose of "sliding keels or leeboards, keeping the vessel to windward "when sailing in deep water, and to be raised up when running "before the wind," or in shallow water. The foremost wheel is suspended in its place by chains passing over pulleys and carrying counterbalance weights. A platform is attached to the chains so that a man by stepping thereon can raise the wheel. The aftermost one, as appears from the drawing, is to be raised by a tackle. A paddle may be attached to a wheel of this character, and it may be driven by power, so as to serve as a propeller. There is also a sliding rudder "suspended "by a chain or rope passing over a pulley, so that it may "be raised or lowered at pleasure." The drawing shows a rudder fitted in the usual manner to a boat or barge but hanging a little below the bottom. A rope is attached to it so that it can be hauled up till its lower edge is on a level with the bottom.

The rest of the Specification does not relate to this series.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 6 (*new series*), p. 165; London Journal (*Newton's*), vol. 9 (*conjoined series*), p. 231.]

A.D. 1836, July 13.—N° 7149.

ERICSSON, JOHN.—"Propeller applicable to steam naviga-"tion."

The propeller consists of a pair of "hoops" fitted with spirally-set blades revolving on a horizontal shaft at the stern. The rudder is "divided into two parts held together by two "strong wrought-iron stays," "fixed one on each side having "wide loops or bends," and between these the propeller shaft passes.

[Printed, 1*s*. Drawing. *See* London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 34; Mechanics' Magazine, vol. 27, p. 130, vol. 28, p. 215; vol. 29, pp. 143 and 283, and vol. 42, p. 225; Artizan, vol. 8, pp. 187 and 209, Bourne on the Screw Propeller, pp. 30 and 34.]

A.D. 1837, July 19.—N° 7406.

DRAKE, JOHN POAD.—"Shipbuilding."

Among other improvements is one for "steering with a "sweep instead of a rudder." As appears from one of the figures, a sweep is pivotted at the stern of the boat in place of the rudder. There is also "a plan for trussing the rudder

" of river craft." According to the figures given, eye-bolts or braces are fixed both to rudder and stern-post, and the two are connected by a bar passing down through the eyes. " Instead " of metal the fastening generally to be made of wood."

[Printed, 4*s*. 2*d*. Drawings.]

A.D. 1837, October 14.—N° 7445.

DE RIGEL, ANTONIN PIEUX.—Steam engines.

The object of the invention is to enable a steam vessel to be steered by means of its paddles. The paddle on each side is worked by a separate engine, both engines being supplied from a common boiler. At the junction of the main steam pipe with the pipes leading to the cylinders is a cock so arranged as to allow the steam to pass to either cylinder, or to both. There is also a cock for cutting off the supply altogether. By these means the velocity of the paddles can be regulated, so as to steer the vessel. The cutting-off apparatus is worked by levers from a convenient point in the ship.

[Printed, 1*s*. Drawings. *See* London Journal (*Newton's*), vol. 12 (*conjoined series*), p. 103; Mechanics' Magazine, vol. 32, p. 757.]

A.D. 1839, March 20.—N° 8006.

RUTHVEN, JOHN, and RUTHVEN, MORRIS WEST.—Propelling vessels, &c.

Amongst other matters, a method of hydro-propulsion is described. Water is received in a tank at the bows through openings in the sides of the vessel; thence it passes by a pipe to a centrifugal pump, and thence through two tubes, one to each side of the vessel. These lead to short tubes external to the hull and open fore and aft. By means of valves, the jets may be directed both astern or both forward, or one in each direction so as to steer the vessel.

[Printed, 1*s*. 2*d*. Drawings. *See* Repertory of Arts, vol. 13 (*new series*), p. 78; Mechanics' Magazine, vol. 32, p. 156, also vol. 40, p. 90; Practical Mechanics' Journal, vol. 3, pp. 71, 88, 110, and 258; also vol. 4, p. 17; Inventors' Advocate, vol. 1, p. 115.]

A.D. 1839, September 9.—N° 8214.

RAPSON, JOHN.—"Steering ships."

The object of the invention is to obviate the mischievous consequences caused by the slackness of the tiller ropes which results from the end of the tiller moving in an arc, while the

ropes work in a straight line. The tiller ropes, instead of being fixed to the tiller, are attached to a slider which works between guides fixed across the ship tangentially to the arc described by the tiller end. The end of the tiller passes through a slot in the slider, or the tiller is slotted, and embraces a pin on the slider, so that the circular motion of the tiller end is converted into rectilinear motion in the slider. The tiller ropes may pass to the barrel of the steering-wheel in the usual way, or the power may be increased by fitting pulleys on the slider and carrying the tiller ropes to a fixed point after they have passed round these pulleys.

In order to check the motion of the rudder still further, each tiller rope, after leaving the barrel of the steering-wheel, may pass round a pulley on which is a ratchet and pall. The ratchets on the two pulleys act in opposite direction, so that while one gives to the action of the rope, the other remains fixed, and the rope has to be dragged over a fixed surface.

[Printed, 1*s*. Drawings. *See* Repertory of Arts, vol. 13 (*new series*), p. 326; Inventors, Advocate, vol. 2, p. 195.]

A.D. 1839, October 10.—N° 8236.

HUMPHREYS, JOHN BARNETT. — "Improvements in ship-
" ping."

The object of one portion of the invention is to enable the rudder to be partially raised out of the way of the waves. For this purpose there is "a joint in the rudder near the keel." In shallow water the "tail" of the rudder is lifted by any convenient means. "In a sea-way, on the contrary, it is " lowered to any inclination that may be found best suited," " keeping the rudder high enough to secure steerage, yet below " the lash of the surge. In selecting the means of lifting the " tail, care should be taken to avoid such as would prevent the " tail from rising, if it should chance to come in contact with " a taught warp on the ground."

"In vessels drawing much water but steering badly," a portion of the rudder is made to slide down when in deep water below the keel, either "in a trunk formed in the rudder similar " to a sliding keel" or "in grooves on one side" of it. The sliding part may be formed of a sheet of metal. It is raised " by rack and pinion at the rudder head or other appropriate " means."

Some improvements in sliding keels are also described. They are improved "by bearding them fore and aft ways under "water," and they have the "bolts right through." They are also tapered off below. They may be of cast or wrought iron or of two iron plates connected by cross pieces. The trunk may be of metal either in iron or wooden vessels. The keel is lowered and raised by an endless chain passing down a slot therein and over a roller at the bottom of the slot. The chain passes over a drum worked by a winch handle, and is at one point fixed to the keel. The action of this chain serves to drive the keel down, instead of its being carried down merely by its own weight. The keel is retained at the proper height by a ratchet, and may be fitted with counter-balance weights. Sliding keels may be applied to steam vessels.

[Printed, 10*d*. Drawing. *See* Inventors' Advocate, vol. 2, p. 260.]

A.D. 1839, November 23.—N° 8280.

HUNT, JOHN.—"Propelling and steering vessels."

The vessel is steered by altering the direction in which the screw propeller acts. The propeller is mounted on a short shaft which passes across the base of a vertical tube or case at the stern. In this case is a shaft which drives the propeller shaft by means of bevel gearing and is driven in a similar way by the engine shaft. To the head of the case is fitted a toothed sector which engages with an endless screw worked through suitable gearing from a steering-wheel on deck mounted with its axis vertical.

[Printed, 10*d*. Drawing. *See* Mechanics' Magazine, vol. 32, pp. 175 and 285, also vol. 33, p. 33; Inventors' Advocate, vol. 2, p. 340; Appendix D. to Tredgold, p. 54.]

A.D. 1839, December 16.—N° 8322.

ROBINSON, JOHN.—"Steering apparatus."

A toothed quadrant on the rudder-head takes into an endless screw on the shaft of the steering-wheel. The bearings in which this shaft works are fitted in a frame which is pivotted to a stanchion by a single pin, so that the whole frame carrying the wheel and its screwed shaft is free to rotate on a vertical axis. The screw is partly contained by two semi-cylindrical covers called "travelling nippers" one below and one above. On one side these fit into a recess in the quadrant, and on the

other they are screwed together. They are belayed to the frame. When a wave strikes the rudder, the quadrant carries the frame a small distance, sufficient to lessen the shock, and prevent injury to the teeth. The spring of the rope by which the "nippers" are belayed together is sufficient to bring them back into position. As the entire apparatus is only secured by a single pin turning loosely in a socket, it is free to rise and fall whenever the rudder is lifted by touching the ground or otherwise. A similar arrangement may be applied to steering apparatus that works by cog-wheels instead of an endless screw.

[Printed, 10*d*. Drawing. *See* Inventors' Advocate, vol. 2, p. 405.]

A.D. 1840, June 13.—N° 8545.

CARPENTER, EDWARD JOHN.—Propelling and steering ships.

The principal part of the Specification is occupied with screw propellers, by some of which the vessel may be steered as well as propelled. For this purpose a screw is mounted under each quarter on a shaft with a universal joint. This shaft is supported at its outer end by a stay or otherwise so that it can be raised or lowered. Both screws are actuated by a capstan geared with their shafts, so that by driving them in one or the other direction the ship can be manœuvred. There is also an improvement in the rudder. The propeller is mounted in a frame abaft the rudder and the propeller shaft passes through the rudder from edge to edge. To enable the rudder to work, it is divided across at the point where the shaft passes through it, and the two parts are connected by an iron bow which surrounds the shaft, and allows the rudder to play over it.

[Printed, 8*d*. Drawing. *See* London Journal (*Newton's*), vol. 20 (*conjoined series*), p. 332, and vol. 44 (*conjoined series*), p. 382; Mechanics' Magazine, vol. 33, p. 608, vol. 34, p. 257, vol. 49, p. 222, and vol. 60, p. 345; Inventors' Advocate, vol. 4. p. 20; Engineers' and Architects' Journal vol. 4, pp. 56 and 158.]

A.D. 1840, September 3.—N° 8614.

HOLMES, WILLIAM DAUBNEY.—"Naval architecture."

The only portion of the invention relating to this series consists in "steering or guiding boats by a rein." As figured in the drawing, the boats to which the invention is to be applied are square ended and wall-sided. They are connected together in trains, a jointed lever on one boat being pivotted to a short arm on the next. Each boat is connected to the next in the

series by two of these joints, one at each side, so that by pressing on the lever, or hauling on a line attached to its end, the two boats can be brought nearer together at one side and inclined to one another. A number of boats may thus be steered from the first boat of the train, the line on each side being attached to all the levers on that side.

[Printed, 10*d*. Drawings. *See* Mechanics' Magazine, vol. 34, p. 223; Inventors' Advocate, vol. 4, p. 164.]

A.D. 1841, June 10.—N° 8981.

BODMER, JOHN GEORGE.—Propelling vessels, &c.

The propulsion is effected by means of two jets of water driven by centrifugal pumps through apertures in the sides of the vessel. Of these pumps there are two, working on vertical shafts, and from each pump two tubes lead, one forward and the other aft, to orifices in the sides. Slide valves are fitted to these tubes, so that by opening or closing them as required, the water can be admitted to any of the tubes, and the vessel steered as well as propelled.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1843, January 19.—N° 9592.

HAMER, JAMES.—Propelling vessels.

To propel a vessel, according to one method described, "highly condensed air" is driven out by a suitable apparatus in one or more jets from the stern. From the compressing apparatus a tube leads to the bows and the stern, where it may be divided and lead to orifices one on each side of the keel. By means of a three-way cock the jet is directed in the direction required. For steering, branch pipes lead from the main tube at right angles thereto. Preferably there are "four tubes, one coming out on each of the quarters aft, and "one on each side of the fore part of the ship." These are brought into use by means of valves in each tube.

[Printed, 10*d*. Drawing. *See* London Journal (*Newton's*), vol. 24 (*conjoined series*), p. 4.]

A.D. 1843, January 19.—N° 9598.

SUNDERLAND, THOMAS.—Propelling vessels, &c.

A propeller of peculiar form is described. The shaft on which it is mounted is "carried out through the stern-post "*and beyond* the rudder." "The rudder is to be divided for

" this purpose into two parts which are connected by bands of " iron." "The connecting bands have a bend outwards in the " middle, so as to allow of the rudder being put right star- " board or larboard."

[Printed, 6*d*. Drawing.]

A.D. 1843, May 18.—N° 9733.

WALKER, ROBERT, junior.—" Propelling ships and boats."

Vessels are propelled by means of a screw or a " shaft with " radial arms " working in a tubular channel within the vessel. This channel may be forked and divided into two tubes both before and astern of the screws, and these tubes have their outlet at any convenient part of the hull, one on each side of the hull. By means of valves at the mouths of the tubes the jet may be controlled and directed so as to aid in steering, or to steer the vessel entirely.

[Printed, 6*d*. Drawings. *See* Mechanics' Magazine, vol. 39, p. 376.]

A.D. 1843, July 11.—N° 9830.

LAIRD, JOHN.—Construction of vessels.

When a steamboat or other vessel is constructed to carry a rudder at each end so that either end may serve as bow or stern, the inventor fits a guard over the rudder, this guard being of such shape as to serve as a cut-water. The rudder which is not in use is for the time being fixed in position by a bolt.

In vessels which have no keel and no dead wood, but taper away astern, a horizontal bar is fixed in the position the keel would occupy if there was one. This is supported by vertical bars fixed to the timbers of the ship. An iron stern-post joins this bar at its end. The rudder is hung entirely below the level of the bottom of the vessel and is attached by means of arms sloping diagonally from its upper edge to the bar above mentioned. Sockets on these arms fit on the bar so that the rudder may turn thereon and may also slide up and down so as to rise and fall on touching the ground, &c. The rudder is worked, as appears from the drawing, by chains fixed to its after edge and led inboard.

[Printed, 2*s*. 4*d*. Drawing. *See* Repertory of Arts, vol. 3 (*enlarged series*), p. 257; and vol. 19 (*enlarged series*), p. 109; Patent Journal, vol. 12, p. 122. Act of Parliament, 14 and 15 Vict., cap. 5, 1851.]

A.D. 1843, July 13.—N° 9833.

MAUDSLAY, JOSEPH.—Propelling vessels.

According to one portion of the invention a vessel is propelled by a screw mounted "abaft of the stern-post," and there are two rudders instead of one, "whereof one is disposed beneath "each of the stern quarters of the vessel," "each of those "rudders being an upright cylindrical axis of iron" which passes down through a tube both ends of which are fastened to the vessel. The lower part of this iron shaft is flattened out to form the blade, and this portion hangs free below the end of the tube. The blade may be of any suitable form and is made with sharp edges. The rudders are worked by tillers above which may be worked independently or together, and for the latter purpose they may be linked together and motion transmitted to them from a third tiller actuated by any suitable steering apparatus. The connecting links between the two tillers may be flexible, so as not to give any pushing effect, but only to pull over the lever desired to be put in action, leaving the other free. Thus by use of rigid connections both rudders are worked at once, by the use of flexible connections, one only is employed at a time.

[Printed, 1*s.* 4*d.* Drawing. *See* Mechanics' Magazine, vol. 40 p. 129; Engineers' and Architects' Journal, vol. 7, p. 37.]

A.D. 1843, August 16.—N° 9868.

BROWN, JAMES.—Working chain cables, also steering ships.

The steering apparatus is of the following description:—The steering-wheel shaft is prolonged some distance aft and has on its after end a drum. The rudder head is just aft of the steering wheel and the tiller is of such length that its end passes directly below the drum. Blocks are fitted on short arms pivotted on the end of the tiller, and these blocks are joined by a "bridle" chain which passes round a block on the tiller a short distance from its end. The tiller chains are thus arranged:—A chain fixed at a point in the side opposite the drum passes through one of the blocks on the tiller, then back through a fixed block in the side, then round the drum, through a fixed block on the other side of the vessel, back through the other block on the tiller and, lastly, to a fixed point on the other side of the vessel to that whence it started. "The com-

" bining divergance of the tiller from a straight fore-and-aft " position, combined with the tightening influence of the " bridle " " cause the tiller rope to be always kept perfectly " taught on the lee side."

[Printed, 1*s.* 4*d.* Drawings. *See* Mechanics' Magazine, vol. 40, p. 113; Engineers' and Mechanics' Journal, vol. 7, p. 112.]

A.D. 1844, January 14.—N° 10,009.

FOULERTON, ROBERT.—" Machinery for moving vessels."

A propeller of any suitable form is set in a tube at right angles to the keel at the bows or stern. The propeller may be a screw, wheel, &c. It is driven by an endless band over its shaft, or by gearing of any suitable character. The motive power may be supplied from the engine, or be manual power applied by a capstan, an endless band over pulleys, or otherwise. Sliding valves may be applied to close the ends of the tubes and may be raised by a rack and pinion or otherwise.

[Printed, 8*d.* Drawings. *See* London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 81.]

A.D. 1844, May 30.—N° 10,205.

DEANE, CHARLES ANTHONY.—" Improvements in construct- " ing, propelling, and steering vessels."

[No Specification enrolled.]

A.D. 1844, July 3.—N° 10,243.

BODMER, JOHN GEORGE.—Steam engines, marine propellers, &c.

Improvements in these and other matters are described in the Specification. There is amongst the inventions described an improved rudder, which is double, and consists of a cast-iron, wrought-iron or brass tube, with flanges standing out on each side, to which wooden wings are attached. " On the top of the " tube a spun (spur ?) wheel is fixed, into which gears " a pinion, which is in connexion with a steering wheel, whereby the rudder is worked. Through the tube a wrought-iron turned shaft passes, which is screwed at the bottom into a brass footstep, " the latter being firmly fixed to the keel of the " vessel." " In case of the rudders requiring to be unshipped, " it is only necessary to remove " an iron strap, to shift back

a beam, and to hoist the rudder up through a hole in the counter. "On replacing the rudder, the shaft" "serves as a "guide, and the operation is therefore comparatively easy." The drawing shows a rudder with a central shaft having a blade on each side, the blade on the aftermost side being continued a short distance beyond the end of the shaft. It is mounted on bearings below in a long spur projecting from the keel below the screw propeller, aft of which the rudder is shipped.

[Printed, 4*s.* 6*d.* Drawings.]

A.D. 1844, July 3.—N° 10,249.

MONZANI, WILLOUGHBY THEOBALD. — Construction of vessels.

The rudder is shipped in the usual manner. It is divided in two parts by a line sloping diagonally across it from the bottom of the rudder-stock. This portion is hinged to the main portion by "lever arms or joint straps" so as to be capable of rising and falling if it touches the ground, &c. Any other way of connecting the two parts together may be employed.

[Printed, 10*d.* Drawing. *See* London Journal (*Newton's*), vol. 26 (*conjoined series*), p. 155.]

A.D. 1845, January 23.—N° 10,493.

BORRIE, PETER.—"Construction and fitting or equipping of "ships or vessels."

Various improvements in ship-building are described. Of these the following relate to the present series.

The rudder is "formed of a frame covered with plates," "the plates being turned round at the fore end, so that with "the side of the frame they form a round hole through the "whole depth of the rudder." Notches are cut out in this tubular part to correspond with eyes formed on the stern post, and a round rod is passed down through the whole from the deck, to hold the rudder in position. A vessel is described which is formed with both ends alike, and there is to be "a "rudder at each end placed in an aperture within the vessel." Each rudder "has an upright square spindle passing through "it," which is placed some small distance on one side of its "*centre, so that* there is a longer portion of the rudder on

"one side of the axis than at the other." Each rudder is "worked by a horizontal spoke wheel connected to the spindle "of the rudder by a toothed wheel and pinion."

[Printed, 1*s.* 10*d.* Drawings. *See* Artizan, vol. 7, p. 73.]

A.D. 1845, February 20.—N° 10,531.

HALL, SAMUEL.—Steam engines, propulsion of vessels, &c.

A method of hydro-propulsion is described, but the patentee does not refer to any method of using his apparatus for steering.

A method is also described of propelling a vessel by "vibra-"ting planes." Four vertical shafts are fitted to the vessels sides one on each side at the bows and stern. On these shafts blades are fixed, which, as shewn in the drawing, resemble rudder blades. A reciprocating motion is given these shafts by connecting rods from an engine-shaft amidships. Each shaft is fitted at top with a ratchet wheel and two palls, either of which can be disengaged from the ratchet by means of a cam intermediate of them, so that the shaft can be turned and the blade set at any angle. By thus altering the position of the blade, the propellers are to be used for steering, and propelling the vessel "sideways and around as if turning on a pivot."

[Printed, 3*s.* Drawings. *See* Artizan, vol. 10, p. 2.]

A.D. 1845, March 3.—N° 10,544.

GORDON, ALEXANDER.—"Producing motive power by the "action or agency of heat."

The products of combustion are carried from two furnaces, one on each side of the vessel, to a pipe leading to the outside. This pipe divides into two branches, one leading forward and the other aft. To each branch a valve is fitted so that the jets may be directed both astern or both ahead or one in each direction to steer the vessel.

The apparatus is denominated a "fumific propeller."

[Printed, 10*d.* Drawing. *See* Engineers' and Architects' Journal, vol. 8, p. 331; Mechanics' Magazine, vol. 43, p. 273, and vol. 46, p. 205.]

A.D. 1845, June 12.—N° 10,721.

ROSENBORG, FREDERICK.—Constructing, propelling, and steering vessels.

By means of pumps suitably arranged, water is pumped into a cistern or reservoir in a vessel from whence it may be discharged through tubes having outlets in the vessel's sides at the bows and stern, for the purpose of steering. These outlets are fitted with valves governed by levers on deck.

The rudder of a vessel is fitted in the dead-wood below the water-line, so as to be out of the way of injury. It is worked by a tiller in the ordinary way.

The propeller is shipped either before or abaft the rudder.

[Printed, 10*d*. Drawing. *See* London Journal (*Newton's*), vol. 28 (*conjoined series*), p. 332.]

A.D. 1845, October 2.—N° 10,847.

CLARK, ROBERT, and PIRNIE, ALEXANDER. — "Steering "vessels."

The shaft of the steering-wheel communicates motion by an endless chain to a second shaft below it, on which is an endless screw. This screw works in a toothed quadrant on the rudder head, and thereby actuates the rudder. The lower shaft is packed with cork or other soft substance in its bearings to deaden shocks. The pillars which support the upper shaft are adjustable in height by being made telescopic and fixed by a screw.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 7 (*enlarged series*), p. 277; Engineers' and Architects' Journal, vol. 9, p. 185.]

A.D. 1845, December 10.—N° 10,995.

HAYS, CHRISTOPHER DUNKIN.—"Construction and adaptation "of apparatus for propelling and steering vessels."

No improvements in steering apparatus are described. In order to enable the vessel to steer better, the blades of the propeller can be brought into a line with the keel, and covered with a shutter. No portion of the Specification appears to deal with matters really connected with this series.

[Printed, 10*d*. Drawing. *See* London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 73; Patent Journal, vol. 1, p. 74.]

A.D. 1846, March 25.—N° 11,143.

McSWENY, THOMAS JOHN.—"Steering ships."

The steering wheel, instead of being keyed firmly on the shaft, is fitted thereon in gimbals, so that it has play upon it, *and can be placed* at any angle with it. On it is a circular

rack, and opposite this is a similar rack, fixed on a standing frame and surrounding the shaft. Whenever necessary, the teeth of these racks may be caused to engage with each other by turning the wheel to one side the other, and the wheel, and consequently the whole of the steering gear locked.

The drum round which the rudder chains are wound is of somewhat ovoidal shape, and has a groove on it. By this means the slack is wound up, as the chain is taken in faster by the central portions of the drum, than by the portions near the ends. The ends of the chains are fixed to the drum, and they pass through fixed blocks at the sides of the vessel, then through blocks on the tiller, and back to the sides.

[Printed, 6*d*. Drawing. *See* Repertory of Arts, vol. 8 (*enlarged series*), p. 298; Patent Journal, vol. 1, p. 308.]

A.D. 1846, July 14.—N° 11,295.

BROWN, Sir SAMUEL.—Construction of vessels, &c.

Part of the Specification relates to a method of shipping rudders. There is a "metal rudder pipe, securely fixed to "the stern-post, passing up the transum, the mouth of the "pipe being two feet above the load-water line," "the shaft "of the rudder being made of copper or strong amalgamated "metal." The rudder shaft "is not necessary to be connected "with the stern-post at all." "The head of the shaft rests in "the upper mouth of the rudder pipe, or a metal toggle or "fid. The head of the rudder is provided with a strong eye-"bolt," "to which a chain" "is attached by a shackle and "bolt." "Suppose the rudder, for convenience, is hung to "the quarter, something like an anchor to the bow chain" "being rove in the pipe, the end is brought up to the rudder "head and shackle to the eyebolt; lower the rudder down, or "drop it, if preferred, like an anchor, it will immediately "become plumb with the centre of the rudder pipe. Apply "the pin purchase to the chain, it cannot fail to enter the "pipe when it is drawn up to its place in the pipe to enter "the fid or toggle."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1847, January 14.—N° 11,530.

GOLDSMID, LIONEL CAMPBELL.—"Applying rudders to "ships."

[No Specification enrolled.]

A.D. 1847, May 4.—N° 11,685.

HENWOOD, WILLIAM.—Propelling and steering vessels.

The first part of the invention relates to a method of shipping a screw propeller. It is placed astern of the rudder, the latter being "on the fore side of the screw propeller in the "lower and aftermost part of the run, and below the pro-"peller shaft, the rudder being substituted for the same part "of the run of the vessel." The rudder stock passes through the kelson, which runs below the shaft. The surface of the rudder may be "as large as that of the immersed part of the "common rudder," but it is preferred to reduce it by rounding it off its lower outer corner. The rudder stock is affixed to the rudder by bands, and is square at the part where they meet it. The braces on the stern-post surround it, and it is cylindrical at those points, so that pintles are not required. The upper part of the stock is also cylindrical, and passes through a stuffing-box; above this a ring is formed on it, so that the shaft may pass through it, while sufficient play is allowed to permit the rudder to turn.

A jury rudder may be shipped by fitting it with a piece which slides in the groove made for the propeller frame to slide in, the propeller being unshipped for the purpose. The lower end is secured with guys.

A rudder may be fitted as above to ships not propelled by a screw. "Such a rudder could be either shipped or unshipped "afloat by attaching a water-tight hose or cylinder to the "rudder-head cylinder, so that the rudder-head" "may be "drawn up in unshipping the rudder, or replaced in shipping "it." "A temporary rudder could" "be applied by having "braces fitted specially for it." The keel may be prolonged under the rudder for a short distance.

The remainder of the Specification relates to the construction of the hull.

[Printed, 1*s*. Drawings. *See* Repertory of Arts, vol. 11 (*enlarged series*), p. 7; Patent Journal, vol. 3, p. 570; Engineers' and Architects' Journal, vol. 11, p. 47.]

A.D. 1847, October 7.—N° 11,887.

BROWN, Sir SAMUEL.—"Propelling and steering vessels," &c.

The inventor says:—"The improvement in steering is "*effected by the* increased influence which is given to the

" rudder by the additional depth of the sliding keel." Two figures of a sliding keel are given, but there is no description thereof. Nor does there appear to be any further reference to it in the Specification.

[Printed, 3*s*. 2*d*. Drawings.]

A.D. 1848, February 8.—N° 12,050.

FOWLES, ROBERT.—"Propelling."

A vessel is propelled by means of sets of fan-shaped blades caused to vibrate either vertically or horizontally at the stern. If the blades vibrate vertically they are hinged on a shaft connected with the stern-post, and this shaft can be turned to one or other side by a tiller, so that the action of the blades may tend to steer the vessel. To actuate the blades there is a rod passing through them to which each is fixed, and this is linked to an oscillating quadrant, by which the required motion is effected. If the blades vibrate horizontally, the shaft on which they are attached has a cross-head keyed thereon, and this is actuated by connecting rods passing through stuffing boxes in the stern. It is not stated how the steering is to be effected, but, "for greater security," there may be a rudder in the dead-wood, before the propelling apparatus.

[Printed, 10*d*. Drawing. *See* London Journal (*Newton's*), vol. 33 (*conjoined series*), p. 170; Artizan, vol. 6, p. 273; Patent Journal, vol. 5, p. 975.]

A.D. 1848, November 18.—N° 12,331.

CULLEN, THOMAS.—"Steering ships."

This invention consists in using two additional rudders, one on each side of the stern-post and hung on gudgeons in the ordinary braces. The stern-post may be hollowed sufficiently to allow these rudders to lie flush with the sides. The tillers work one above the other and both under the ordinary tiller. They are secured so that they cannot be forced open by the action of the water. The tiller ropes are worked as follows:—
" Divide the tiller ropes on each side about midway between
" the barrel and the sheave or block at the side of the ships;
" attach to each end of the part on the barrel a hook, and to
" each end of the other parts a cringle or eye; the other tiller
" ropes having cringles at their ends and being kept rove,
" the part on the barrel may be hooked on to either."

The invention also consists of a method of shipping a temporary rudder. If the ship have a moveable propeller a rudder may be shipped on a piece of wood which slides in a groove in the main stern-post so as too ccupy the place of the propeller.

When this is not the case, the ship should have an iron cover "fitting the stern-post, and fitted with braces and gud- "geons on it, the same as the stern-post but mismatching or "not coming exactly over the ordinary gudgeons, openings, "or holes in the sides just under the braces, to admit," "drop catches or bolts" "placed on each side the stern-post, "admitting of the rising of the case, but preventing it "lowering by dropping into the holes in the sides of the "case; the inside of the back to be lined with wood, and "apertures to admit the gudgeons on the stern-post, but to "be so rounded at their edges, that they do not check its "upward progress, though they admit the gudgeons into the "apertures in the wood on the case descending. A piece of "wood should be shaped for a main post of a rudder, and "fitted for braces and pintles, the braces to be joined at the "after end with a large gudgeon or hoop to receive a spar" "with holes for bolting, the upper braces becoming shorter, "so as to bring the spar against the head of the main post, "and admit of its pointing through the rudder case. A heel "or shoe brace should be made for the bottom, and the "space between the main post and the spar should be filled "up with deals or boards, and the whole fitted by bolting or "wedging. The rudder being hung on the gudgeons of the "iron case, the whole may be put overboard, the spar being "pointed through the rudder case by a tackle leading through "to it."

[Printed, 1*s*. Drawing. *See* Repertory of Arts, vol. 14 (*enlarged series*), p. 4; London Journal (*Newton's*), vol. 34 (*conjoined series*), p. 339; Mechanics' Magazine, vol. 50, p. 497; Patent Journal, vol. 7, p. 83.]

A.D. 1848, November 29.—N° 12,344.

LANE, JOHN, and TAYLOR, JOHN. — Constructing boats, &c., &c.

A ship's rudder "is suspended" "with part of its surface "in front and part behind its point of suspension" the stock being affixed down the centre of the blade, instead of at one *edge*,

In vessels driven by a screw propeller, the latter may be fitted astern of the rudder, which is hung in a sort of frame before the stern-post. The propeller shaft passes through the rudder-stock, which has on it a bow to permit the play of the rudder, and the blade of the rudder is cut right away on each side for the same purpose.

[Printed, 3*s.* 2*d.* Drawings. *See* Mechanics' Magazine, vol. 50, p. 526; Patent Journal, vol. 7, p. 107.]

A.D. 1849, March 28.—N° 12,538.

GUERIN, PIERRE RENE.—"Steering ships."

Methods of working the rudder by means of screw nuts, bevel wheels, &c. are described.

1. The steering-wheel shaft passes over the rudder-head, on its ends right and left handed screws are cut, and these have corresponding nuts on them. These nuts are connected by rods to the rudder-head on each side, so that as they approach or recede from each other they turn the rudder. The wheel may also be placed in any part of the ship and its movement transmitted to the screw through chains, &c.

2. There is one long nut on the shaft which is screwed and passes beside the rudder-head. Each end of this nut is connected by a rod pivotted thereon to a short arm on the rudder-head, the rod being also pivotted to the arm.

3. A nut on the shaft as above has on it in a pin which works in a slot in the tiller.

4. A cogwheel on the shaft takes into two other cogwheels on parallel and opposite shafts which are screwed in opposite directions, and have each a nut connected by a rod to a short arm on the rudder-head.

5. The shaft passes over the rudder-head. Its ends are screwed in opposite directions. Nuts on these screws are connected by jointed levers to arms on the rudder-head.

In connection with this modification two methods of hanging the rudder are shown. In the first a box fixed round the rudder-post works on rollers fixed to a ring on deck. In the second two sets of rollers are fixed on the deck; one set works under a ring on the rudder-post, the other horizontally against an "angle ring" about the rudder.

6. The shaft passes beside the rudder-head. On it are two "spiral grooved barrels" with right and left handed grooves. A chain from each barrel is attached to an arm on the corresponding side of the rudder-head.

7. A cogwheel on the shaft drives cogwheels on two parallel and opposite shafts. Right and left handed endless screws on these drive a cogwheel on the rudder-head.

8. Endless screws as in (7.) have on them nuts which are connected by jointed arms to the rudder-head.

9. An endless screw on the shaft drives a cogwheel on a vertical axis. Diametrically across this wheel is fixed an arm, the ends of which are connected by rods to arms on the rudder-head.

10. An endless screw on the shaft has on it a nut. This nut has jointed to it on each side a lever working on a fixed pivot. Connecting rods from arms on the rudder-head are pivotted to these levers, the rod on one side between the fulcrum and the nut, the rod on the other side outside the fulcrum. The effect of this is that one movement of the nut produces motion in opposite directions of the two connecting rods, and so turns the rudder.

11. A right and a left handed screw are formed on the shaft. A fork on a lever pivotted at a fixed point embraces each screw. The other ends of the levers are pivotted to connecting rods from arms on the rudder-head.

12. An endless screw on the shaft drives two cogwheels, one on each side. Connecting rods for arms on the rudder-head are pivotted excentrically on these wheels.

13. A bevel wheel on the shaft drives a similar wheel on a vertical axis. This drives eccentrics as in (12.)

14. A similar wheel drives two others on a horizontal shaft. These work the rudder as in (12.)

15. A similar wheel drives one wheel as in (14). On the horizontal shaft are pinions working in racks attached to connecting rods as above. To give the racks the requisite opposite motions, one is above, and one below its pinion.

16. The shaft is at right angles to the line of the keel. On it is an endless screw which works a cogwheel on a vertical axis. To opposite points in the circumference of this wheel connecting rods, as above, are pivotted.

17. A bevel wheel on the shaft drives another on a horizontal *shaft on which are eccentrics* as in (12.)

18. This resembles (10.) except that the levers, instead of being pivotted to the nut, have pins working in slotted arms thereon. The connecting rods also are jointed.

19. This resembles (8.) except that the connecting rods are jointed. A similar arrangement may be adopted in any of the modifications.

[Printed, 1*s.* 8*d.* Drawings. *See* Mechanics' Magazine, vol. 51, p. 327; Patent Journal, vol. 8, p. 33.]

A.D. 1849, June 20.—N° 12,663.

CAMPBELL, Alexander Francis.—Ploughs, steam boilers, propulsion of vessels, &c.

The only portion of the Specification connected with the present series consists in a "mode of constructing and ap- "plying lee boards having two or more arms or joints for "attachment to the vessel, and with or without a rudder "thereto to facilitate the propelling of vessels." The inventor also says, "these boards at all times rise or fall parallel, as is "shown by the drawings, they being controlled at both ends; "and in some cases I apply a rudder to such lee boards, to "come into use should the stern rudder be lost or injured, "but the same may be used with the ordinary rudder." These two passages form all the description given. The drawings show a vessel with boards hinged above to her sides, so as to hang vertical when she rolls. An ordinary rudder is attached to the sternmost end of one of these boards and appears to be worked by a tiller projecting inboard.

[Printed, 3*s.* 4*d.* Drawings. *See* Mechanics' Magazine, vol. 51, p. 616; Patent Journal, vol. 8, p. 200.]

A.D. 1849, July 18.—N° 12,708.

LEIGH, Evan.—Steam engines.

Several improvements in steam engines are described. Amongst others the paddles of a steam vessel may be worked by separate engines, the supply of steam to which is regulated by a throttle valve or otherwise. By this means the paddles may be used to steer the vessel, independently of a rudder.

[Printed, 1*s.* 6*d.* Drawings. *See* London Journal (*Newton's*), vol. 36 (*conjoined series*), p. 288; Mechanics' Magazine, vol. 52, p. 76; Patent Journal, vol. 8, p. 209.]

A.D. 1849, August 10.—N° 12,739.

RUTHVEN, JOHN.—Propelling vessels.

The vessels are propelled by means of a turbine supplied by a pipe communicating with the external water and discharging the water through outlet pipes situated at a suitable part of the vessel; "the direction in which it is discharged being "obtained by a nozzle or bent pipe at each side of the "vessel on the outside communicating with the pipes from "the machine in the vessel, and made to move in a socket "fixed in the side of the vessel, so that the direction of dis-"charge may be changed as required." By this means the vessel may be propelled backwards or forwards, or turned round as required. The nozzles are to be operated from the deck or elsewhere, and independently of each other and the motive power engines. The vessel can thus be steered without help from the rudder.

[Printed, 1*s.* 10*d.* Drawings. *See* Mechanics' Magazine, vol. 52, p. 138; Patent Journal, vol. 8, p. 271.]

A.D. 1849, October 12.—N° 12,803.

CHRISTOPHER, JOHN.—"Naval architecture."

A number of improvements in ship-building are described. Of these :—

The first consists of a method of steering vessels by twin rudders, one on each side. These rudders are preferably "about one-fourth of the vessel's length from the fore-foot," but they may be placed "at some distance on the foreside of "the foremost sternpost." A pipe is fitted down through the vessel, and in this is the shaft of the rudder, the blade being of small vertical length. The shaft is supported on a collar above, and, if required, on bearings below. A small wedge-piece is fixed to prevent the rudder being brought forward beyond a position at right angles to the vessel's side. The rudders are worked separately by any suitable gear. The shaft and pipe are preferably vertical, but if they rake at all it should be aft and not forward. To stop the ship, both rudders are put hard up. If preferred, the shafts of the rudders may be attached by eye-bolts to the ship's side.

The twenty-fifth also consists "in making a temporary "*rudder,* which is composed of two fins, out of some short

"pieces of planks placed over each other crosswise, and "bolted or nailed together." In one side of each fin there are holes to reeve a rope "which is to serve the purpose of "hinges and to keep the fins in a vertical position in the "water, and they are then fastened to part of a bower cable, "which is put overboard and brought round the vessel's "bottom abreast of the foremast, and then bowsed taut. A "rope guy from the outer end of each fin leads aft where the "guy is fixed to prevent the fins traversing forward beyond "an angle of about ninety degrees from the vessel's side, and "there is a rope leading forward from the outer end of each "fin to a block at the end of a topsail yard, temporarily "fixed on the deck a short distance abaft the stem, which "latter rope leads inboard to a tackle or tiller, and thus the "vessel is steered."

[Printed, 2s. Drawing. *See* Repertory of Arts, vol. 20 (*enlarged series*), pp. 247, and 269; Mechanics' Magazine, vol. 52, p. 318; Patent Journal, vol. 9, p. 142.]

A.D. 1849, November 24.—N° 12,860.

CALLAWAY, GEORGE, and PURKIS, ROBERT ALLÉE.—Propelling ships, &c.

Water is drawn out of two openings near the bottom of the hull to propel the vessel. For steering a plate is hinged near each outlet, so that it can be turned to close the opening and also when partly closed act as a rudder to direct the issuing stream of water. Each plate is pivotted on a shaft, on the top of which is a toothed quadrant engaging with an endless screw on the end of one of two shafts which are operated by a steering-wheel of the usual sort on a shaft parallel with the two first-mentioned shafts and communicating motion thereto by a pair of endless bands.

[Printed, 1s. Drawings. *See* Mechanics' Magazine, vol. 52, p. 437; Practical Mechanics' Journal, vol. 3, pp. 106 and 259; Patent Journal, vol. 9, p. 117.]

A.D. 1850, January 11.—N° 12,923.

FAYRER, ROBERT JOHN.—"Steering apparatus."

The improvements consist in applying a brake to the steering-wheel in such a way that it can be brought into action by the steersman's foot. On the axle of the steering-wheel is a drum, round which is bent a metal strap lined with pieces

of wood. One end of this strap is fixed to the deck and the other to the end of a lever. To the same end of this lever another similar lever is connected by a link, so that the brake is brought into action by pressing down either lever. On one end of the strap is an adjusting screw coupling to tighten or loosen the brake.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 16 (*enlarged series*), p. 151; London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 25; Mechanics' Magazine, vol. 53, p. 56; Artizan, vol. 8, p. 116; Patent Journal, vol. 9, p. 177.]

A.D. 1850, January 17.—N° 12,933.

TAUNTON, WILLIAM GEORGE HENRY.—Steering apparatus, &c.

An endless screw on the shaft of the steering-wheel drives a cog-wheel on the centre of a barrel round which ropes are coiled that pass round a drum on the rudder-head and are secured thereto by a screw. As the ropes are coiled in opposite direction on the barrels, every movement of the steering-wheel is transmitted by them to the rudder.

[Printed, 2*s*. 6*d*. Drawings. *See* Mechanics' Magazine, vol. 53, p. 58; Patent Journal, vol. 9, p. 187.]

A.D. 1850, January 19.—N° 12,934.

LAIRD, MACGREGOR.—"Improvements in the construction of "metallic ships or vessels, and in materials for coating the "bottoms of iron ships or vessels, and in steering ships or "vessels."

No description is given in the Specification of the portion of the invention relating to this series, and by Disclaimer, dated July 19, A.D. 1850, the inventor disclaimed that portion of the title relating to coating and steering ships.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 16 (*enlarged series*), p. 134; London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 33; Mechanics' Magazine, vol. 53, p. 76; Patent Journal, vol. 9, p. 188.]

A.D. 1850, January 24.—N° 12,941.

LONG, JOSEPH, LONG, JAMES, and PATTENDEN, RICHARD.—Steering ships and applying power.

On the end of the rudder is fixed a toothed quadrant with large teeth, some four inches in breadth. The shaft of the steering-wheel is on a level with this quadrant, and has on it a "*plate*" *or solid* wheel, on the face of which is a "curvilinear

"lever" or volute. This takes into the teeth of the quadrant, and thereby works the tiller. Or a similar volute may take into the cogs of a wheel on a horizontal axis at right angles to the line of the steering-wheel shaft. Chains from this wheel work the tiller. Also a similar plan to that first described may be used, except that the steering wheel works a second wheel by means of an endless chain, and this second wheel works the tiller as above.

The remainder of the Specification describes other applications of the invention.

[Printed, 2*s*. 4*d*. Drawings. *See* Mechanics' Magazine, vol. 53, pp. 79 and 81; Practical Mechanics' Journal, vol. 5, p. 94; Artizan, vol. 9, p. 172 and vol. 10, p. 160; Patent Journal, vol. 9, p. 224.]

A.D. 1850, June 1.—N° 13,095.

TUCKER, JOHN.—(*A communication.*)—Propelling vessels.

The propeller shaft passes at the side of the stern-post and rudder, and the propeller itself is astern of the rudder. "A "small notch is cut in the rudder in the wake of the shaft, to "allow of its being put hard up or down."

[Printed, 1*s*. 4*d*. Drawings. *See* Mechanics' Magazine, vol. 53, p. 473; Patent Journal, vol. 10, p. 117.]

A.D. 1850, September 5.—N° 13,246.

COCHRANE, WILLIAM ERSKINE, and FRANCIS, HENRY.—Propelling and steering ships, &c.

Two methods of steering are described. In the first a rudder is pivotted in a socket on an arm projecting astern from the keel, and the upper part of the rudder shaft works in bearings fixed in the vessel. In the second, two rudders are used "on "either side of the quarter of the vessel." These "have "their bearings altogether within the vessel," and are connected above by levers to a tiller working on a pivot in the deck. The form preferred by the inventors, as shown in the drawings, resembles a broad flat paddle with an elongated blade.

[Printed, 1*s*. 6*d*. Drawings. *See* Mechanics' Magazine, vol. 54, p. 216; Engineers' and Architects' Journal, vol. 14, p. 166; Patent Journal, vol. 10, p. 258.]

A.D. 1850, September 5.—N° 13,250.

BEATTIE, JOHN.—Steering vessels.

The invention is intended for vessels with screw propellers. *The propeller is* fitted astern of the rudder, and its shaft is

supported in bearings on a frame within which the rudder works. The shaft passes across the rudder, which is divided horizontally into two portions to admit of this. The rudder stock has an elliptical hole in it, through which the propeller shaft passes, and this allows sufficient play to the rudder.

In a Disclaimer, dated October 20, A.D. 1851, the patentee and Frederick Chapple state that they believe part of the Specification not to be novel, and to have been anticipated by Ericsson's Specification, No. 7140, July 13, 1836. They therefore disclaim the use of a divided rudder as above, except when it is used in connection with a "stern framing" as above.

[Printed, 8*d*. Drawing. *See* Repertory of Arts, vol. 18 (*enlarged series*), pp. 362 and 364 for Disclaimer; London Journal (*Newton's*), vol. 38 (*conjoined series*), p. 332; Mechanics' Magazine, vol. 54, p. 216; Engineers' and Architects' Journal, vol. 14, p. 167; Patent Journal, vol. 10, p. 269.]

A.D. 1850, November 7.—N° 13,324.

ROBINSON, JOHN.—Steering ships, &c.

In the part of this Specification devoted to subjects connected with the present series, five methods of actuating ships' rudders are described.

In the first, a fixed screw is formed on the shaft of the steering wheel. On this a nut works, to which a link is attached. This link is fitted to a screw in the rudder head. The shaft of the wheel is not directly above, but is beside the rudder-head, so that as the nut works up and down the screw it works the rudder.

In the second, a pinion on the steering-wheel shaft takes into a rack below it, pivotted on the end of a horizontal lever, the other end of which is pivotted to a sliding socket on the shaft. On this lever below it is a vertical arm, which passes through slots in two arms fixed on the rudder-head, and by this means actuates the rudder. This arm has a second horizontal arm on it, parallel with the lever above, and pivotted to a fixed point below the point where the lever is pivotted.

In the third, a sliding bar with a rope, which winds on and off drums on the shaft, is substituted for the rack and pinion described above.

In the fourth, a screwed barrel is fitted on the steering-wheel shaft, so as to slide on it but not turn on it. A fixed pin on a bar above fits into the screw, and causes it to slide when the shaft revolves. Cords pass round this barrel, and round a

drum on a fixed vertical axis. On the bottom of this drum is a projection which takes into a groove in the rudder head, and works the rudder as the drum revolves.

In the fifth, a mitre wheel on the shaft of the steering-wheel works in a toothed semi-circular segment fixed on an axle abaft the rudder. On this axle is a cross-head, and each end of the cross-head is connected by a rod to a lug on the rudder-head.

A rudder is also described which is made in two parts, the lower half being caused to slide in a case which forms the upper half. Or a pin may be fixed in one half, and may work in a slot in the other half, so as to allow them to slide one upon the other.

[Printed, 4*s*. Drawings. *See* Mechanics' Magazine, vol. 54, p. 307; Patent Journal, vol. 11, p. 100.]

A.D. 1850, November 12.—N° 13,340.

WIMSHURST, HENRY.—"Improvements in steam engines, in "propelling, and in the construction of ships and vessels."

The first part of the invention relates to improvements in rotary steam engines. The second part refers to improvements in screw propellers, which are to be placed abaft the rudder. It also consists "in the construction of a bow steering appa- "ratus of one or more blades, so attached to the shaft that the "angle at which they are placed with the axial line of the "shaft may be readily changed, so as to stand in the most "effective position." Four of these blades are fixed by means of arms on a central shaft, so that they can revolve each on its own axis. By means of a pinion and endless screw actuating a lever on each arm, the required alteration is made in the position of the blades. This apparatus or any other propeller is fitted in the bows, or "near to the stern of a vessel, with the "shaft at right angles to the keel, so that when the propellor "is put in motion the head of the vessel may at once be carried "round to either quarter, according to the direction in which "the apparatus is made to revolve." The third part of the invention relates to a mode of constructing "tug and other "vessels." These are built "with an aperture through the "bow or fore part, sufficiently large to contain the steering "apparatus before described, with its shaft or axis laid "'athwart ships,' that is, crosswise, and at right angles with "the keel."

[*Printed, 3s. 6d.* Drawings. *See* Mechanics' Magazine, vol. 54, p. 413, and *vol. 55, pp. 281* and 301; Patent Journal, vol. 11, p. 136.]

A.D. 1850, December 12.—N° 13,409.

BAXTER, SAMUEL.—Ships' windlasses.

Several sorts of windlasses are described, and of two of them it is stated that "they may be employed for working the "rudder for steering ships or vessels, for which purpose it "will only be necessary to mount the ordinary steering wheel "on the axle or spindle of the pinion in place of the handle."

The first of these windlasses is meant to be portable. A spindle has a square end, which fits in a suitable hole in some one of the ship's timbers. On this is a barrel which has on its face an internal wheel. A pinion working in fixed bearings on the spindle engages with this wheel, and this pinion is actuated by a winch handle.

The second resembles the first, except that instead of the pinion being driven by a handle, the handle has on its spindle an endless screw, which engages in a pinion on a spindle set across the face of the barrel; on this spindle is a bevel wheel which drives a cogwheel fixed on the face of the barrel.

[Printed, 1*s*. Drawings. *See* London Journal (*Newton's*), vol. 39 (*conjoined series*), p. 511; Mechanics' Magazine, vol. 54, p. 513; Patent Journal, vol. 11, p. 146.]

A.D. 1851, January 30.—N° 13,476.

WOODCROFT, BENNET. — "Machinery for propelling ves- "sels."

The object of the invention is to vary the pitch of the screw by altering the angle at which the blades are set. Several modifications for this purpose are described, and by the use of certain of them the vessel can be steered by the propeller alone.

1. On the shaft of each blade is a worm wheel, with which a worm gears; the shaft of the worm carries a pinion in gear with a spur wheel on a sleeve about the propeller shaft. By rotating this sleeve the blades can be set at any angle, and the vessel driven backwards or forwards without stopping or reversing the engines.

2. To the shaft of each blade a short crank is attached. The cranks are connected by links to a box which slides on the propeller shaft and revolves with it. By means of a forked *lever having studs* which fit into a groove round the box, the *box may be slidden* on the shaft and the blades thus set to the

required angle. A similar box on the other side of the propeller serves to force a break or wedge against each blade shaft, so as to hold the blades in the required position.

3. In a similar arrangement to (2) each blade is connected to a separate sliding box, the rod of one box passing through the other box. "If the ship has lost its rudder, and the screw "shaft remains stationary, with the propeller blades in a "vertical position, they may by the levers be so moved as to "guide the ship." Also the propeller "may be made to drive "a ship from side to side, by causing each blade to move "through a quarter of a revolution, and back again at each "revolution of the propeller shaft."

4. In an arrangement similar to (1) the blade is set by a rack engaging with a pinion on the shaft of the blade, and moved by a sliding box.

5. In an arrangement similar to (4) the connecting rods attached to the racks are recessed into the propeller shaft, and have on their ends friction bowls taking into one of three grooves in a sliding box which does not revolve with the shaft. The bowl is turned by a switch into the groove required, and according to the particular groove employed, and the position of the box, either fixed or slidden in either direction, the blades may be set at such an angle as to drive the vessel backwards or forwards, or they may be caused to turn in each revolution, so as to present the edge to the water on one side, and the broad surface to the water on the other, and thereby steer the vessel.

6. A method is described of causing the propeller when at rest to fill up the aperture in the dead wood.

[Printed, 10*d*. Drawings. *See* Repertory of Arts, vol. 18 (*enlarged series*), p. 131; Mechanics' Magazine, vol. 55, p. 118; Patent Journal, vol. 11, p. 216.]

A.D. 1851, February 17.—N° 13,515.

BUCHHOLZ, GUSTAV ADOLPH.—"Improvements in motive "power and in propulsion."

Among the improvements described is a method for steering by means of three propellers at the stern. Each propeller is mounted with its bearings in a ring which is fitted in a vertical plane at the stern on pivots, so that it with the propeller is capable of revolution about a vertical axis. To this ring is fixed a *horizontal* cog-wheel. The three cog-wheels of the

three propellers are arranged so as all to gear with a cog-wheel on a vertical shaft rotated by a chain and chain-wheel on its upper end. By this means the propellers can be simultaneously set at any required angle to steer the ship without the use of a rudder.

To give motion to the propellers, on each propeller boss is a bevel wheel in gear with a bevel wheel carried on a short arm fixed to the vertical ring. On the upper end of the shaft of this bevel wheel is a cog-wheel gearing with another wheel on which is a drum with an endless band, which receives motion from the prime motor.

[Printed, 10*s.* 4*d.* Drawings. *See* Mechanics' Magazine, vol. 55, p. 158.]

A.D. 1851, May 13.—N° 13,632.

CARPENTER, EDWARD JOHN.—Ship-building, and propelling and steering ships.

Amongst other improvements, the inventor proposes to form a water-space at the vessel's stern by making the stern double. In this space the propeller works. "Each stern-post has a "separate rudder." "A steering wheel or apparatus should "be used capable of steering either with two rudders moving "together in parallel lines or separately."

[Printed, 10*d.* Drawing. *See* Mechanics' Magazine, vol. 54, p. 461, vol. 55, p. 401, and vol. 58, p. 96; Engineers' and Architects' Journal, vol. 14, p. 608; Patent Journal, vol. 12, p. 100.]

A.D. 1851, August 14.—N° 13,715.

GRINDROD, JONATHAN.—Ships' rudders, &c.

The inventor proposes to use two rudders, one on each side of the stern-post, "which is slightly recessed for their accom-"modation, and projects a few inches beyond the after or "free edge of the rudder." Only one of the rudders is brought into action at the same time according as it is required to carry the vessel to port or starboard. "They are provided "with a proper lever apparatus on deck, so that they may be "worked in conjunction or separately."

[Printed, 1*s.* Drawings. *See* Mechanics' Magazine, vol. 56, pp. 157 and 161; Practical Mechanics' Journal, vol. 5, p. 7.]

A.D. 1852, January 13.—N° 13,895.

SMITH, ROBERT JOHN.—"Apparatus for steering ships."

1. The chain from the barrel of the steering-wheel is carried *over a helically-grooved* roller on each side below the wheel,

the helices being right and left handed respectively. The axes of these barrels are in the same horizontal line. The barrels are hollow, and cut respectively with right and left-handed female screws, into which fit the ends of a screwed rod with corresponding male screws. As the barrels are revolved by the action of the chain, their motion carries the rod backwards and forwards longitudinally. A boss on this rod fits in a slot on a radially pivotted arm having a cross-head fixed to it, and on the same pivot. Chains from this cross-head pass round a drum on the rudder-head.

2. The tiller is fitted in the shaft of a cross-head, chains from which pass round a drum on the rudder-head. A similar arrangement may be made, in which the chains from the steering-wheel actuate directly an arm fitted with a cross-head as above.

3. Steam is employed as an auxiliary power to work the rudder in addition to the means above described, or any other. A small steam cylinder is fitted so that its piston may work the tiller arm directly. A cord on the drum of the steering-wheel passes over a friction wheel which works the slides of the cylinder. This wheel is fitted so that it may just carry the slide with it by its friction, and then turn freely on its axle.

[Printed, 1*s.* 2*d.* Drawings. *See* Mechanics' Magazine, vol. 57, p. 59; Engineers' and Architects' Journal, vol. 15, p. 267.]

A.D. 1852, January 31.—N° 13,944.

HEDIARD, ALEXANDER.—Propulsion of vessels.

The propeller described consists of a pump delivering a jet of water through a tube leading out through the bottom of the hull. This tube is curved, and so fitted that it can be turned to deliver its jet in any direction. It can therefore be used for steering the vessel, as well as propelling and backing her. The movement of the outlet tube is effected by means of a rod passing up to a convenient point in the vessel. More than one such propeller can be employed.

[Printed, 8*d.* Drawing. *See* Mechanics' Magazine, vol. 57, p. 138.]

A.D. 1852, May 22.—N° 14,130.

ROBERTS, RICHARD.—Construction of ships, &c.

Among the numerous improvements described is one connected with rudders. There is no stern-post, and "the after

" part of the vessel is rounded and sloped from the bottom " upwards." There may be more than one rudder, one abaft the other when two are used, as shown in the drawing. They are " placed with their upper edge parallel to that part of the " hull under which they are placed." A rudder is also used at the bows. In the drawing this rudder is shown as below the keel, some distance from the stem.

A life-boat is also described, in which the rudder is fixed on a shaft passing through a stuffing box, and furnished with a handle for steering. As shown in the drawing, the rudder is formed as a segment of a circle, and is wholly immersed at the stern of the boat.

[Printed, 8*s.* 2*d.* Drawings. *See* Mechanics' Magazine, vol. 57, p. 137.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 4.—N° 207.

NAPIER, WILLIAM DONALD, and LUND, WILLIAM.—"Steering vessels."

The invention relates to methods of actuating the rudder by power.

1. A steam cylinder is employed which is placed at right angles to the line of the keel. To the piston of this cylinder two rods are fitted, one on each side. Each rod has on its end a block over which passes a chain connected at one end to the tiller, and at the other to a fixed point in the vessel's side. The cylinder is fitted with suitable steam valves and ports by which steam may be admitted on either side of the piston as required. To the end of each piston rod also a chain is affixed, which is fastened to the end of the similar rod of a piston with two rods working in a cylinder filled with water. This water cylinder acts as a brake, and the lever handle which regulates the steam supply is also arranged to open or close the valve *from either end of* the water cylinder.

2. A similar arrangement may be used with hydraulic force instead of steam as a motor.

3. The water brake may be applied to an ordinary steering apparatus.

4. The steam steering apparatus may be used without the water brake.

[Printed, 8*d*. No Drawings.]

A.D. 1852, October 21.—N° 471.

PROVIS, JOHN. — (*Provisional protection only.*) — Ship-building.

The following is one among several improvements described :—

"It is also proposed to adapt a false keel or a number of "small keels to the iron keel of the vessel; these false keels "are enclosed between the plates which form the fixed keel, "and they may be lowered down as required."

[Printed, 4*d*. No Drawings.]

A.D. 1852, November 13.—N° 732.

SMITH, ROBERT JOHN.—"Steering ships."

Improvements on No. 13,895, A.D. 1852.

On the shaft of the steering-wheel is a barrel, a chain from which passes round a grooved drum on a horizontal axis below. The shaft of this drum is cut with a screw on it fitting in a female screw within the drum, and the ends of this shaft are square and slide in suitable bearings. By this means when the wheel, and consequently the drum, is rotated, the shaft is moved longitudinally. This motion is transmitted to the rudder by chains. The two chain-barrels are of the same size and the screw has "threads of such rake that they may traverse "the entire length of the cylinder in one convolution."

The steering-wheel is secured by a "linch-pin" so that it can be removed in case of accident and a tiller substituted for the above steering gear.

[Printed, 8*d*. Drawing.]

A.D. 1852, November 17.—N° 776.

BRESSON, FRANCIS.—"Propelling on land and water."

A jet of water is driven out through a tube at the stern or *other suitable position* to propel a vessel. The inventor says :

—"To alter the speed of emission of the reacting fluid I can "make the opening conical, and arrange it so as to turn either "side to cause the boat to tack about during its motion."

[Printed, 10*d*. Drawings.]

A.D. 1852, November 23.—N° 829.

GRISDALE, JOHN EDWIN.—(*Provisional protection only.*) —"Steering ships."

The entire Provisional Specification runs as follows :—"This "invention consists in so arranging the rudders of ships and "vessels, that a balance or partial balance of resistance may be "obtained on each side of the working centre of the rudder, "which is effected by placing the working centre in such a "position that a portion of the rudder may project beyond "each side of it, instead of the hinge or working centre being "at one extreme edge, as in rudders of the ordinary construc- "tion."

[Printed, 4*d*. No Drawings.]

A.D. 1852, December 17.—N° 1095.

KINGSTON, JOHN FILMORE.—"Improvements in obtaining "reciprocating motion, and in propelling and steering "vessels."

In one part of the Specification a method of propelling and steering is described. A horizontal blade is fitted to a vertical shaft at the stern of the ship. Suitable mechanism is described for giving this blade an oscillating motion by which the vessel is propelled. It may also be used as a rudder alone, in which case a toothed wheel is fitted on a vertical axis on the shaft, and this receives motion from a pinion on a horizontal shaft on which is a drum which receives motion from chains actuated in any convenient manner.

[Printed, 8*d*. Drawing.]

A.D. 1852, December 21.—N° 1121.

BEADON, GEORGE.—"Constructing and propelling ships and "vessels."

Part of the invention relates to a method of steering by the propeller which has a universal joint on its shaft inside the vessel, with a "curved stuffing box or slide." It can be turned

from side to side by a steering-wheel, which, by means of a rack and pinion, acts on the slide.

The propeller itself is of special shape, and appears from the drawing to be formed like a segment of a ring.

[Printed, 1*s*. Drawing.]

1853.

A.D. 1853, January 6.—N° 33.

BROWNE, JOHN.—(*Provisional protection only.*) — Ship-building.

The vessel described is flat-bottomed, and has "a keel so made " or contrived that its various parts will shut up or be received " inside the ship's hold." Two such keels may be used, "the " whole or any of the parts of these keels to slide in or be " received into a proper casing in the hold." This is called a " yielding keel," and it may be "in several parts as the length " of the ship may render desirable." "The yielding keel is " not a fixture, but works independently, yielding to pres- " sure, is made of iron, something like a double-handed saw " for sawing stones; it is at liberty to work up and down " through the deck, according as it meets with resistance." " In a long built vessel a number of parts of this keel will be " required," and "one or two rows thereof may be used."

[Printed, 4*d*. No Drawings.]

A.D. 1853, January 27.—N° 204.

STURDEE, ALFRED BARNES.—(*Provisional protection only.*) —"Twin-stern ship."

The stern is double, so as to form a space for the propeller to work in. There are two stern ports, and "the ship is " steered by two rudders, which may be made to work simul- " taneously."

[Printed, 4*d*. Woodcut.]

A.D. 1853, January 28.—N° 219.

RUSSELL, JOHN SCOTT.—"Constructing ships and vessels " propelled by screw or such like propeller."

This invention consists in a method of shipping the propeller so that it can be raised out of the water. The rudder "is " below the propeller shaft, and the axis of the rudder is made " with an opening for the passage of the propeller shaft." This opening is shown in the drawing as of considerable length, to allow of the propeller shaft, which is jointed, to be raised along it.

[Printed, 6*d*. Drawing.]

A.D. 1853, February 4.—N° 309.

DUDGEON, JOHN.—"Machinery used for raising propellers."

The object of the invention is to provide a means of raising ships' propellers when they are shipped abaft the rudder, and for this some modifications in the shape, &c. of the rudder are included. There are two posts, one astern of the other, and the propeller is shipped on the sternmost one in such a way as to allow of its being raised out of the water. The rudder works between these two posts, being shipped on the forward one, and is made in two parts to allow the propeller shaft to pass across it.

[Printed, 8*d*. Drawing.]

A.D. 1853, February 8.—N° 337.

BUCHANAN, JOHN.—Propeller.

The invention consists of a propeller which is set in a frame hinged to the stern-post. The propeller shaft is jointed and to the frame above is fixed a vertical shaft. By means of this shaft the frame and propeller are moved in the same way as a rudder, suitable steering gear being affixed at the top of the shaft. There is no rudder, and when the vessel is under sail she is steered by means of the frame acting as a rudder.

Some improvements in the propeller itself are also described.

[Printed, 6*d*. Drawing.]

A.D. 1853, February 18.—N° 424.

MADDEN, PETER.—(*Provisional protection only.*)—"Pro- " pelling, steering and regulating vessels."

A vessel is propelled by means of pistons acting in cylinders open to the stern of the vessel, and driven by any suitable *prime mover*. "Closing and expanding" propellers may also

be used. Similar arrangements may be made at the bows. " In order to facilitate the steering of the vessel, there is a " rudder placed on each side of the same at the stern. These " rudders are likewise so constructed between double stern " posts, and fitted so as to be capable of answering the pur- " pose of presenting a considerable amount of resisting surface " on both sides of their axes or pivots to the water, when " required, for the purpose of stopping the progress of the " vessel. The resisting surface is also increased by means of " a flap or gate let down transversely behind the rudders. " This flap or gate, when acting in conjunction with one of " the rudders only, gives a material aid in quickly turning " the vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1853, March 3.—N° 528.

CLARK, WILLIAM.—(*Provisional protection only.*)—"Pro- " pelling and steering vessels."

The part relating to this series runs as follows :—" My inven- " tion of improvements in steering consist, in the first place, " in the application of steam or other power for that purpose, " in lieu of hand power, as hitherto practised; also to the " apparatus by which such power is communicated. My im- " provements are also applicable for steering by hand power. " In order to give effect to the motive power, the steersman " directs and throws it into action by suitable communication " with the engines or boiler used to impel the ship; or it may " be by the aid of an auxiliary engine, or other prime mover. " In some cases the direct force of steam may be applied for " the purposes of steering through the medium of a cylinder " or pressure chamber, whose means of transmitting power is " placed in communication with the tiller, or other instrument " to move the rudder. Instead of the direct force of steam, " water or other fluid may be employed, which is maintained " under pressure, and which I cause to act in a cylinder or " or pressure chamber in suitable communication with the " rudder, to transmit power thereto. The water is constantly " kept under pressure by the engine or other motive power, " and the steersman has simply to direct the force of the " *water in its action* on the rudder. I also employ the force

" of water, or other fluid, under pressure actuated by hand " power as a means of steering ships. The steersman forces " the water into a cylinder or chamber, having suitable means " of transmitting such pressure, which is brought to bear " upon the rudder. Hand-power may be applied to keeping " up the pressure of the fluid, independent of the steersman, " who may simply direct such power as required."

[Printed, 4*d*. No Drawings.]

A.D. 1853, May 3.—N° 1082.

LIPSCOMBE, FREDERICK.—(*Provisional protection only.*)—Propelling vessels.

Water is driven alternately into one of two pipes, each fitted to one end of a cylinder, within which moves a piston. These pipes lead to the water external of the vessel, and the jet of water propels the vessel by reaction against the water in which it floats. "The outlet pipe at each end of the cylinder partly " fits into a case and may be raised, lowered, or turned, so as " to guide the expelled water in any direction, so as to propel " the vessel in any required direction."

[Printed, 4*d*. No Drawings.]

A.D. 1853, May 21.—N° 1262.

BELLFORD, AUGUSTE EDOUARD LORADOUX.—(*A communication.*)—"Navigable vessels," &c.

A vessel is described which consists of a cylinder to which a frame is attached in such a way that the cylinder revolves while the frame remains horizontal. The vessel is steered by a rudder "nearly resembling a bent oar attached to the stern " end of the frame" "and floating with the blade edge up- " wards." "This is made to act upon the vessel by suitable " tackle, which will draw it in either direction out of line with " the centre of the vessel." As shown in the drawings this rudder consists of a large-bladed paddle, with the blade set at a considerable angle with the loom or shaft.

[Printed, 10*d*. Drawings.]

A.D. 1853, May 25.—N° 1281.

BAUER, WILLIAM.—(*Provisional protection only.*)—*Submarine vessel.*

The inventor describes what he terms a "hyponant apparatus," for use on or below the surface of the water. "The boat is steered or guided in its lateral motion by a rudder "similar to those in ordinary use, and in its upward or downward motion by fins which can be placed at any required "angle with the horizon."

[Printed, 4*d*. No Drawings.]

A.D. 1853, June 3.—N° 1371.

MAUDE, WILLIAM EDWARD.—(*A communication.*)—"Steering ships."

The steering wheel is fitted loose on its shaft, but inside its axle is cut a helical groove in which a pin on the shaft works, so that when the wheel is turned, it is carried backwards or forwards along the shaft till it meets with one of two stops on the shaft against which it is forced, and it then revolves the shaft. On the shaft is fixed a ratchet wheel with square teeth into which take palls on the end of levers pivotted below the shaft. These palls are kept in contact with the wheel by springs so as to prevent the shaft from moving when both are in contact. On the levers also rollers are fitted which rest against rings on a collar fixed to the steering-wheel axle. These rings are each shaped sectionally as an inclined plane, and one looks forward and the other aft. Consequently as the steering-wheel is carried along its shaft, the collar is forced against one of the rollers, the lever and pall raised, and the wheel disengaged on one side, so as to be free to be moved in that direction. By reversing the action of the wheel the other pall is raised. When the wheel is midway between its extreme points, the shaft (and therefore the rudder) is held by both palls and secured against blows from a sea.

The above description appears to coincide with the figures of the apparatus, but in the condensed description of the apparatus given at the commencement of the Specification it is said that a similar object "is effected principally by the "addition of two pawles, placed one on each side of the hub "of the steering wheel, and made to act alternately on a "ratchet wheel placed on the shaft, such ratchet wheel having "an endwise motion on the shaft by means of a male and "female screw, so as to bring it against one or other of the "*pawles*. The wheel is provided with a hub, fitted in such

" a manner as to disengage the pawles, when it arrives at the " end of its course, in either direction."

" In addition to the above arrangement, the tiller or steering " apparatus is provided with sweep chains and blocks. The " drum, round which the chains or ropes are passed, is con- " structed upon the old principle, a number of turns being " taken round the drum with the rope or chain, one end of " which is passed through a block attached to the deck, " then through a block attached to the larboard gunwale " of the ship, then through another block, and to the " gunwale. The other end is in like manner passed through " blocks secured to the starboard gunwale, and through " another block, after which it is attached to the other gun- " wale."

[Printed, 8*d*. Drawings.]

A.D. 1853, June 16.—N° 1460.

FIELD, WILLIAM HENRY GREY.—(*Provisional protection only.*)—Barges, &c.

Barges are formed so that the head of one may fit into the stern of another, and the sterns are consequently formed V-shaped with the hollow outwards. Rudders are fixed on each of the two sterns thus formed. It appears from the drawing as if the rudders were adapted to double close in against the inside of the V, so as to be out of the way when the barges are arranged in a train.

A method is also described of steering the train by shifting the respective positions of the barges. This is effected by means of " chains or ropes conveniently secured to the side " of the barges, " and so situated that by the unslacking of " either side the requisite curve or course may be obtained."

[Printed, 6*d*. Drawing.]

A.D. 1853, July 19.—N° 1711.

BRIMS, DONALD.—" Safety apparatus for the protection and " preservation of life on water."

A boat of peculiar construction is described, which is entirely covered in fore and aft. The rudder-stock passes through a stuffing box into the interior of the boat, and has on it a toothed segment gearing with a pinion on a long shaft which projects

forward in a slanting direction to the place where the steersman's seat is fixed. On the end of this shaft is a steering-wheel of the ordinary sort, except that it is set at an angle in front of the steersman, who is represented as sitting with the shaft coming up between his knees.

[Printed, 1*s*. Drawings.]

A.D. 1853, August 1.—N° 1786.

BUCHANAN, JOHN.—(*Provisional protection only.*)—Propelling vessels.

An improved form of propeller is described in which the blades are to be set in a certain position. This propeller may, among other positions be placed "in the rudder or abaft the "rudder," "and if placed in or abaft the rudder it assumes "the same angle as the rudder, both being moved by a double "lever connected with the steering wheel or tiller, and may be "lowered with the rudder, and again put into gear with the "motive power."

The rest of the Specification does not refer to the present series.

[Printed, 4*d*. No Drawings.]

A.D. 1853, August 4.—N° 1820.

HICKSON, WILLIAM.—"Canal and river navigation."

One part of the improvements described is stated to relate to a mode of propelling and steering vessels on canals, &c., "by "means of an improved screw propeller formed with two "screws revolving in opposite directions and the pitches being "at opposite angles. These screws are only at times about "half immersed in the water, and can be employed for the "purpose of steering by the speed of one or the other being "relaxed, or by both being worked in the same direction so "as to cause the vessel to be easily put about or turned stern "for stern in her own length." This passage is taken from the Provisional Specification. From the Final Specification and the drawings attached thereto it appears that the two screws are mounted in the same line, the shaft of one of them being hollow and the shaft of the other being contained therein. Motion is given to this double screw from the main screw propeller shaft, but no mechanism seems to be shown for

altering the relative speeds, &c. The prime motor is to be a portable steam engine that can be shipped and unshipped as required.

[Printed, 8*d*. Drawing.]

A.D. 1853, August 27.—N° 1997.

HORNBLOWER, JOSIAH.—(*Provisional protection only.*)—"Steering vessels."

The "improvements consist in causing the tiller to travel in "a spiral slot or opening cut in a metallic drum or cylinder "placed across the deck of the vessel, and supported in "suitable standards. A groove is cut at each end of the "cylinder round which a rope or chain may travel. Two "blocks or pullies are secured to the deck a little abaft or "behind the wheel, at the back of which and on its axis is "placed either a wooden or metallic drum or cylinder. A "rope or chain having been secured to the drum or cylinder "in which the tiller travels is passed partly round the groove, "thence through one of the blocks on deck, and carried three "or four times round the drum at the back of the wheel "through the block upon the other side, and finally secured "to the groove at the other end of the large drum or cylinder. "The tiller has a slot at its outer end, through which is "passed a short arm carrying at its lower end a friction roller, "which works in the spiral slot of the drum or cylinder; the "upper end of the short arm is secured to a guide which slides "upon two guide rods fixed to the upper part of the standards "of the drum or cylinder. The spiral slot in the drum or "cylinder makes one turn of the drum, and thus one revolu- "tion of the wheel causes the tiller to traverse from one end "of the cylinder to the other."

[Printed, 4*d*. No Drawings.]

A.D. 1853, October 21.—N° 2436.

FOUQUE, PIERRE MARIE, HÉBERT, LOUIS RÉNÉ, and LE MARNEUR, VINCENT ETIENNE DORET.—"Fortune rudder in "bronze."

The ordinary rudder is shipped in the usual manner and in the usual position. An additional rudder, preferably of bronze, *is shipped with its* pintles in braces on the bands of the stern-

post. It lies against the dead-wood in a slight recess formed for it, and is secured there by a long bolt which passes down from the deck through eye-bolts in the dead-wood which fit through openings in the rudder. When the ordinary rudder is disabled, this bolt is drawn out, a tiller fixed to the head of the "fortune" rudder, and the steering tackle fitted thereon.

[Printed, 10*d*. Drawings.]

A.D. 1853, October 24.—N° 2449.

STAINTON, THOMAS.—"Steering apparatus."

The invention consists in using a drum for the winding on of the rudder-chains "containing one or more annular grooves "of sufficient width only to allow of the chain being wound "on in a single coil." By this means as the chain winds on to the drum each coil lies on the top of the previous one, and the diameter of the circle on which the chain is wound is gradually increased, so that the slack is taken up. In the same way the chain is given off when unwound with a gradually decreasing speed.

The drawing shows a drum fixed horizontally on the steering wheel shaft. The drum has two grooves as above in each of which is fixed a chain which is led through blocks to one side of the tiller. The grooves have each a recess in which the end of the chain is fixed. Instead of the base of the groove forming a circle, it may be "made after the form of a volute."

[Printed, 6*d*. Drawing.]

A.D. 1853, November 17.—N° 2671.

GRIFFITHS, ROBERT.—"Propelling vessels."

Improvements in the screw propeller are described. "The "invention also applies to vessels where the propeller shaft "is passed through an opening in the rudder." For this purpose the rudder is made in two parts, which are "connected "by a conical tubular passage, the larger end being outwards, "through which tubular passage the case with the bearing of "the propeller shaft passes, and the boss of the propeller "comes up to or partly into the conical tubular passage. The "blades of the propeller work wholly or partly within what "would ordinarily be the outer edge of the rudder, for which

" purpose part of the outer edge of the rudder is removed to " produce a hollow in the rudder to receive the propeller, or " in place of the rudder being in two parts the propeller may " be introduced into a recess in the front of the rudder."

[Printed, 8*d*. Drawing.]

A.D. 1853, November 21.—N° 2699.

SCOTT, JOHN, junior. — (*Provisional protection only.*) — " Steering vessels."

" The steering wheel and spindle are rigged and fitted in " the usual manner, but on the after end of the spindle is a " spur wheel in gear with two other spur wheels or pinions, " one on each side, each of such side wheels being fast on the " end of a horizontal screw spindle running parallel with the " steering spindle, and one on each side of it. These two " screws run back towards the steering wheel, their opposite " ends being supported in bearings immediately behind the " steering wheel. The screws are respectively right and left " threaded, and each has a traversing nut entered upon it " fitted to work along a horizontal guide in each case. On " these nuts are stud pins, from which connecting rods or " links pass to corresponding joint studs in the two opposite " ends of a double lever fast on the vertical rudder-spindle, " and answering as the tiller. Thus on turning the steering " wheel, the spur wheel on its spindle causes the two spur " wheels alongside to rotate each in the same direction, and " hence the traversing nuts upon the screw spindles are made " to traverse in reverse directions. This action necessarily " pulls one connecting rod and pushes the other, and this " reverse action upon the double lever of the rudder obviously " turns the rudder, either to starboard or port."

[Printed, 4*d*. No Drawings.]

A.D. 1853, December 5.—N° 2822.

SIMONS, WILLIAM.—(*Provisional protection only.*)—" Pro- " pelling and steering vessels."

The invention is applicable to vessels propelled by screws or similar propellers. The propeller shaft emerges from the centre of the stern-post, and has no after bearing. The rudder

is of large size, and has a part cut away within which the propeller works. The rudder is hung in the usual way, and either a part of the stock is cut away to allow the propeller shaft to pass, or else the stock has an "elliptical eye" or a crank on it for the same purpose. Also the rudder-stock may be placed "a little on one side," and the blade "be so set on its spindle "as when in its central position to lie in a plane passing "through the centre of the stern post and of the propeller "shaft." The stock may have "a slight bend at the part "crossing the propeller shaft," and thereby "the amount of "one-sidedness or eccentricity required will be considerably "lessened."

[Printed, 4*d*. No Drawings.]

A.D. 1853, December 9.—N° 2859.

FOUQUE, PIERRE MARIE, HÉBERT, LOUIS RÉNÉ, and LE MARNEUR, VINCENT ETIENNE DORET.—Rudders.

This invention consists of improvements on No. 2436, A.D. 1853.

The former invention was as follows:—The ordinary rudder is shipped in the usual manner, and in the usual position. An additional rudder, preferably of bronze, is shipped with its pintles in braces on the bands of the stern-post. It lies against the dead wood in a slight recess formed for it, and is secured there by a long bolt which passes down from the deck through eye-bolts in the dead wood which fit through openings in the rudder. When the ordinary rudder is disabled, this bolt is drawn out, a tiller fixed to the head of the "fortune" rudder, and the steering tackle fitted thereon.

According to the improvements described, the rudder may be applied "to any part of the exterior of the vessel," and on both sides at once. It may be of wood, iron, or other material, and may be used as the principal instead of as an auxiliary or jury rudder.

[Printed, 6*d*. Drawing.]

1854.

A.D. 1854, February 4.—N° 277.

MILLS, GEORGE.—Constructing and steering vessels.

A double vessel with a pair of hulls is described. It is propelled by a paddle-wheel in the space between the hulls. There are "steering or manœuvring paddle-wheels placed at each end "of the vessel in such a manner as to be capable of working "in a direction at right angles, or nearly so, to the line of the "keel." These are fitted, one at each end, in the space between the hulls, and are driven by separate engines, or by gearing from the propelling engine.

[Printed, 6*d*. Drawing.]

A.D. 1854, February 14.—N° 356.

HOLM, CHARLES AUGUSTUS.—Propelling.

This invention "consists in the propulsion of bodies by means "of an apparatus in which the propelling power is entirely "concentrated within such apparatus." The power is to be obtained by pumping up water or any heavier fluid, and then discharging it against "percussion plates." The fluid is then again pumped up, so that it can be used over and over again. The whole apparatus is to be contained within a casing which "is fastened to the body to be propelled." The invention may be used for the propulsion of vessels, and one apparatus may be fixed "at or near the stern, and another at or near the "bow of the same vessel, and placed transversely or at right "angles to the keel for the purpose of steering or manœuvering "such vessels."

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1854, April 3.—N° 761.

HODGES, RICHARD EDWARD.—Construction of wheels, &c.

Among other examples of the use of the invention, a steering-wheel is shown, in which the nave is connected with the outer ring of the wheel by a series of india-rubber straps in a state

of tension, instead of spokes. These straps may be arranged in any method preferred, radially or "in a zig-zag direction," or otherwise.

[Printed, 10*d*. Drawing.]

A.D. 1854, April 11.—N° 853.

CARR, THOMAS.—(*Provisional protection only.*)—"Steering "apparatus."

The inventor says:—"I mount the steering wheel in the "usual manner on a horizontal shaft, and at the opposite end "of the shaft I keep fast a chain drum; below this I fix "another chain drum on a longitudinal screw, which carries "also a travelling nut, connected with the tiller by means of "a connecting rod, the tiller lying 'athwart ship,' or nearly "so, when the rudder is in a line with the keel. There are "two chains connecting the drums with one another, and each "chain is coiled round each drum several turns, their extre-"mities being fixed. Thus, when the steering wheel is turned, "one chain uncoils from one drum and is wound on to the "other, and vice versâ. Motion is thus communicated "to the screw, and the nut is traversed in either direction, "according to the direction in which the steering wheel is "turned. In order to relieve the screw from any strain com-"municated by the action of the water on the rudder, I cause "the nut to run in longitudinal guides, one on each side of "the screw." "Instead of the drums and chains, gearing "may be used, or the upper horizontal shaft only may be "dispensed with altogether, and the steering wheel attached "directly to the screw. With respect also to the connecting "rod for communicating motion from the traversing nut to "the rudder, any of the known conveniences for converting "rectilinear motion into circular may be substituted."

[Printed, 4*d*. No Drawings.]

A.D. 1854, April 12.—N° 856.

CRUGER, LEWIS.—(*A communication.*)—(*Provisional protection only.*)—"Attaching propellers to ships and vessels."

The propeller is shipped abaft the rudder. Its shaft has on it a universal joint between the rudder and the stern, and the outer portion of the shaft passes through the rudder so that

the propeller is turned therewith and assists in steering the vessel. Instead of the universal joint, any equivalent thereof may be used.

Also the propeller can be mounted in a swinging frame worked by the tiller ropes, and be used to steer instead of the rudder.

[Printed, 4*d*. No Drawings.]

A.D. 1854, May 12.—N° 1058.

NIXON, CHRISTOPHER NUGENT.—"Attaching rudders to floating vessels."

The object of the invention is to allow the rudder to rise and fall when struck by anything. Several modifications are shewn, suited respectively for vessels of different sizes. The first described is intended for ships. On the stern-post is fitted a series of straps with metal eyes; on the rudder is a metal rod, fixed in a similar manner; all the eyes except the lowest are slit, so that the rod may be passed down through them. Below the lowest eye a socket is fitted which rests on a projecting piece from the heel of the sternpost, and into this the end of the rod on the rudder fits. A plate on the top of the stern-post shuts down over the rod and is held down by pins, but allows the rod to rise through it. Or a bar of T-iron may be fixed along the stern-post. This is embraced by several clamps having eyes on their ends. Similar eyes are fixed by straps to the rudder, and a rod passed through both these sets of eyes connects the rudder to the clamps on the T-bar. The end of this hinge rod rests in a spur on the heel of the stern-post.

The second modification is intended for smaller vessels. A pin passes through eyes fixed along the edge of the rudder, and along this pin, or along part of it, is formed a T-shaped piece which fits in a groove in the stern-post. A plate on the top of the stern-post, as above, fits down over the pin. Instead of a T-piece and a groove, a clip-piece embracing a T-bar as above may be used.

In the third modification a pin is fixed along the stern-post, and eyes on the rudder fit over it. In the upper part of the stern-post there is a groove in which fits a pin carrying eyes. These pass over the hinge pin and support it.

In the fourth modification a tube is fixed to the stern-post. Pintles on the rudder fit into this tube, openings being made at

suitable places to admit them. This tube may be slit throughout its length, and one long pin instead of several pintles may be employed. Portions of the tube are cut away to allow free play to the braces on the rudder.

Instead of the hinged piece folding down on the top of the stern-post, a ring sliding on a rod fixed at both ends to the stern-post may be used. This slides down over the hinge pin.

[Printed, 10*d*. Drawing.]

A.D. 1854, May 17.—N° 1097.

RABIER, JEAN MARIE.—(*Provisional protection only.*)—Keels.

The keel of a flat-bottomed vessel is "hinged longitudinally "to the bottom." "By means of some suitable apparatus "placed inside the vessel this moveable keel is placed either "vertical to the flat surface of the ship's bottom, or it is "turned down upon the same and laid parallel or flat on it." "The keel is kept firm on the ship's bottom, in the vertical "or parallel position to it, by means of another apparatus "placed inside the vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1854, May 23.—N° 1156.

SMITH, JULIUS, and THOMAS, FRANK SANDOM.—(*Provisional protection only.*)—"Steering ships."

The inventors say:—"Our invention has for its object the "steering of ships and other vessels by an arrangement of "mechanism, through the intervention of which the action of "the waves upon the rudder may be prevented from altering "the position of the steering-wheel, in such manner as to "obviate the danger generally incidental to the most efficient "steering apparatus in which the screw is employed, namely, "of the breaking or carrying away of the rudder by the said "action; to effect which object we employ, in connection with "the ordinary steering wheel, a screw shaft and nut of short "rake and pitch, giving motion to a horizontal traversing "guide rod, which acts upon an oscillating drum wheel, "round which the steering chains are coiled. The interior of "the drum wheel is fitted with a transverse cylinder contain-

" ing a piston, against which volutes or spiral springs are " caused to press; an arrangement of friction rollers coupling " the steering chains with the piston is so acted upon, and " independantly of the steering wheel, that the action of the " waves upon the rudder may bring into play the spring, and " relieve the parts connected with the steering-wheel."

[Printed, 4d. No Drawings.]

A.D. 1854, May 24.—N° 1157.

LIPSCOMBE, FREDERICK.—(*Provisional protection only.*)—" Guiding ships and boats."

Boards of wood or plates of metal are fixed "on one or both " sides of the keel of a ship or boat, or in the keel." "They " are so placed as to be parallel when not in action with the " onward course of the vessel; but when in action they are " set to any convenient angle." The object is "to assist the " rudder in guiding the ship or boat under certain circum- " stances, such as when the wind or current is acting more or " less on the side of the vessel, tending to drift her out of her " course." "This drifting of the vessel," says the inventor, " an ordinary rudder, placed as it is at the extremity of a " vessel, cannot prevent; under these circumstances, I project " the board or metal plate before mentioned, that is, on the " leeward side of the keel, in an oblique direction. The " water, as the vessel moves onward, strikes it, tending " thereby to drive the vessel sideways, in a direction more or " less contrary to the course of the side wind or the side " current."

[Printed, 4d. No Drawings.]

A.D. 1854, June 2.—N° 1224.

ALDBOROUGH, BENJAMIN O'NEALE STRATFORD, Earl of.—" Locomotion on land and water."

The Specification deals chiefly with aeronautics, but there is a sort of vessel described which is said to be available for navigation. It is fitted with an "elastic propeller, which also " performs the office of a rudder; it is formed of planks of " elastic wood strengthened by any elastic material." "Elastic " heads" are to be employed in some manner not specially explained for "steering or changing the direction of the vessel,

" by moving both or either of them towards one side or the " other."

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1854, June 14.—N° 1295.

PICKUP, JAMES.—"Steering apparatus."

Upon the rudder-head is fixed a metallic cap, "from which " project upwards two studs opposed to each other in a " direction across the vessel when the rudder is in a central " position." "Between the two studs and axially with the " vessel," is fixed a horizontal shaft, upon which is mounted the steering wheel. "This shaft passes through the centre " of a hollow screw, and is fitted with a longitudinal key, so " that the screw may revolve with the shaft when the latter " is turned, but may at the same time be free to slide " thereon lengthwise. On each side of the screw is mounted " a horizontal link, each link having a cross slot, into which " the studs before-mentioned respectively enter. The ends " of the links are bent at right angles, and one end of " them forms a nut, in which the screw works, its other " end being drilled to receive the shaft, in order to con- " stitute a guide to its motion; the other link has eyes " at both ends, through which the shaft passes, but the " internal distance between its two eyes is precisely the length " of the screw, which it accordingly embraces longitudinally. " By this arrangement when the shaft is turned by means of " the steering wheel, one link will be traversed in one direction " while the other will be compelled to have a motion the " contrary way. Thus through the intervention of the studs " passing through the slots, the rudder will be caused to move " on its axis, and this in a direction corresponding to the " direction in which the steering wheel is turned. Instead of " using cross slots in the links, the pins on the rudder cap " may have their attachment to the latter through the medium " of connecting rods."

[Printed, 8*d.* Drawing.]

A.D. 1854, June 24.—N° 1394.

SKELTON, THOMAS.—"Tillers or yokes."

The invention "consists in fitting two blocks or sheaves on " the tiller or yoke between those on the free end and the

" rudder head. The object of these blocks is to take up the " slack of the steering rope or chain, which is made to work " through them before passing to the drum of the steering " wheel."

The invention may be applied with a single or double purchase. The rope is attached to a fixed point, passes thence over the two pulleys on the tiller, and then to the wheel. Or the rope may pass from the fixed point over the pulley on the tiller nearest the rudder-head, thence over a fixed pulley, thence over the pulley on the end of the tiller, and to the wheel. The arrangement with tillers or yokes is similar, two pulleys being placed on each side of the tiller, or on each half of the yoke on the same side of it.

[Printed, 6*d*. Drawing.]

A.D. 1854, July 1.—N° 1444.

JOHNSON, JOHN HENRY.—(*A communication from Messrs. Payerne and Lamiral.*)—" Submarine navigation."

A boat adapted for use either on or below the surface of the water is described. It is steered by a rudder, the shaft of which passes through stuffing boxes in the top and bottom of the hull. On it are two tillers, one outside for use when the vessel is on the surface, and one inside to be employed when the boat is submerged.

No other part of the invention relates to this series.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1854, August 28.—N° 1879.

CARR, THOMAS.—" Steering apparatus."

An eccentric is pivotted on a vertical axle below the steering wheel. An arm is secured thereto, the end of which is pivotted to the tiller; a quadrant of larger radius than the eccentric is secured thereto, and to the ends of this quadrant the ends of the lines from the barrel on the steering wheel shaft are fastened. By this means the rudder is actuated.

The object of the invention is to prevent shocks on the rudder being transmitted to the steering apparatus.

Instead of an eccentric, a crank or lever, or even a circular pulley, may be employed.

[Printed, 10*d*. Drawing.]

A.D. 1854, September 7.—N° 1953.

LUND, HENRY.—"Propelling and steering vessels."

The method of steering vessels is by an oar-like rudder, which is mounted "within the vessel behind the stern post." The shaft passes through an aperture in the stern, which is kept water-tight by means of a stuffing box "in the middle " of a V-shaped brass or bell-metal crescent which turns with " the shaft," "and is held in contact with a corresponding " seat in the body of the frame," where it is mounted, by set screws acting on a spring. Two of these rudders may be used, one in each run of the vessel, in place of or in addition to the rudder at the stern. "A similar arrangement of rudders might " be made at the head and bows of the vessel, and worked " simultaneously at any convenient part of the vessel by " suitable connecting links, chains, or ropes." The rudders are to be worked "by the same mechanical arrangements as " are now applied to a rudder."

[Printed, 2*s*. Drawings.]

A.D. 1854, October 21.—N° 2245.

SMITH, JULIUS, and THOMAS, FRANK SANDOM.—"Appa- " ratus for steering ships."

The object of the invention is to prevent shocks on the rudder being communicated to the steering apparatus. This is effected by means of a spring interposed between the steering gear and the rudder, this spring being of such strength as to transmit the motion of the steering gear to the rudder, but yield to any violent shock on the rudder.

According to one method there is a screw formed on the steering-wheel shaft, and on this is a traversing nut. This nut has pivotted to it one end of a lever, the other end of which actuates an arm attached to the piston of a helical spring acting within a cylinder. The cylinder is pivotted to the tiller, which is forked for the purpose.

According to a second method chains are led from the end of the tiller to the pistons of similar springs. To the links connecting these chains and the piston the steering chains are hooked.

A device for locking the wheel is also described. A stop or bolt is pivotted on a bracket on the deck in such a way that by

pressing with the foot on a plate fixed on its end, the stop is raised and comes against one of the handles of the wheel. When not in action, the stop is kept down by a spring.

[Printed, 8*d*. Drawing.]

A.D. 1854, November 13.—N° 2403.

ABADIE, Ismaël Isaac.—"Working screw propellers."

The end of the propeller shaft with the propeller is separate from, though in a line with, the rest of the shaft, and is mounted in a swinging frame, the position of which can be governed by means of a vertical shaft connected with a steering wheel. By this means the propeller can be set at any angle to steer the vessel. Motion is communicated to the propeller by means of bevel wheels on both portions of the shaft in gear with a bevel wheel mounted loosely on the vertical shaft above mentioned. It is preferred that the rudder should be worked by the same wheel which moves the propeller and frame.

Two modifications are given, "by which the bevil gearing "may be dispensed with." In the first there is a ring, with a groove into which pins on the ends of the propeller blades fit. The blades "are connected in pairs, and set in a contrary "direction to each other, the shafts which unite them being "bent, in order to allow of their passing over each other in "the centre, inside a hollow boss, formed of two parts bolted "together." "The ring governs the position or pitch of the "screw blades, as, by causing it to advance or retire, the "blades are caused to turn on their pivots." To steer the vessel the ring is "turned in one direction or the other," and this causes the blades to be presented edgewise to the water on one side. The ring is mounted in guides, so that it can be moved backward or forward to alter the pitch of the screw, or varied in inclination "either horizontally or vertically."

According to the other modification the parts of the propeller are united by a ball-and-socket joint, and the ball "is pro-"vided with two small pins" "which work in slots formed in "the socket." The frame and the rest of the apparatus are as described with relation to the first part of the Specification. There is a clutch arrangement for throwing the "screw out of "gear with the driving shaft" when the joint requires oiling.

When the screw is used for propulsion only, the parts of the shaft are to be connected by a clutch, and the steering apparatus thrown out of gear with the screw shaft.

[Printed, 1s. Drawing.]

A.D. 1854, November 21.—N° 2461.

HUNT, EDMUND.—Ship-building.

An improvement in rudders is described. This consists in "employing a single rudder placed at the bow of the vessel." The rudder "may be hung in any convenient manner, but it "is preferred to arrange it with its axis of vibration at or "near its front edge." It may be attached to a rudder-post, or may have a "guard frame" fitted up in front of it. The invention, though applicable generally, is specially intended for "vessels with double sterns and two propellers."

[Printed, 2s. 2d. Drawings.]

A.D. 1854, November 29.—N° 2513.

HYDE, JOHN MOORE.—"Iron steam ships."

One portion of the invention relates to "the construction of "the stern-post of the ship, and the main post of the rudder, "by making the same to terminate as far below the deck as "possible, though the main post of the rudder from this point "is continued upwards by a post or bar of brass, or other "non-magnetic material, so that the 'local attraction' of such "iron ships may be reduced."

[Price 10d. Drawings.]

1855.

A.D. 1855, January 9.—N° 57.

HALL, HENRY JOHN, DALGETY, ALEXANDER, and LEDGER, EDWARD. — (*Provisional protection only.*) — "Propelling "guiding, and manœuvring ships or boats."

The vessel is impelled by a stream of water driven by any suitable forcing apparatus through a tube passing from stem to stern. At one part of the tube is a reservoir, and from it four tubes lead to the sides of the vessel at the bows and

stern. These open to the water at right angles to the side. The vessel can be driven ahead or astern, or turned as required by forcing water from the proper tubes, they being all furnished with valves for the purpose.

Also a vessel may be steered and manœuvred by means of a paddle wheel at bow or stern, or both bow and stern, which acts in a direction at right angles to the keel.

[Printed, 4*d*. No Drawings.]

A.D. 1855, January 24.—N° 180.

ANDERSON, Sir JAMES CALEB.—"Steering ships."

Vessels are steered by power. Across the ship is fixed a cylinder with a piston having a rod on each side. Chains are carried from the ends of the rods to the tiller. Compressed water or steam is admitted by means of a three-way cock to either side of the piston. This cock is opened by a handle within reach of the steersman, which also opens an exit valve on the opposite side of the piston to that on which the steam is admitted. Safety valves are fitted to relieve the cylinder from pressure when the rudder is struck by a sea. Steam from the boiler of the ship, or from a separate boiler may be used; or if hydraulic pressure be employed, a force pump driven by the main, or a separate engine, may be used. The air vessel into which the water is driven has a safety valve to regulate the pressure.

[Printed, 1*s*. Drawings.]

A.D. 1855, January 25.—N° 188.

POWELL, HENRY BUCKWORTH. — (*Provisional protection only.*)—"Precautionary keel."

This consists of a strong frame of the same length as the keel, and composed of a horizontal bar which is below and parallel to the keel, and two uprights affixed to the stem and stern-post respectively. These uprights are hinged so that the whole can be drawn up out of water against the side of the vessel. The object of the apparatus is to give notice of shallowing water, so that when the frame strikes the bottom, it can be drawn up and allow the vessel to float off.

[Printed, 6d. Drawing.]

A.D. 1855, February 21.—N° 384.

PIDCOCK, JOHN HYDE.—"Propelling and steering vessels," &c.

A vessel is propelled by a jet of water driven through a tube carried from stem to stern below the water-line. This jet is driven out by means of a "jointed band" fitting along the tube, which has an "undulatory movement" given it by a series of cranks on a crank-shaft above and parallel to the tube. The vessel is steered by means of "vanes, paddles, or "sluices" at each end of the tube. A method of opening and closing these vanes is described. The piston rod of a steam cylinder has fixed upon it a pulley, round which pass chains attached to either end of a rod fixed to the vane, which slides over the outlet of the tube at one side; at the other side is a second vane similarly arranged, and a like arrangement is made at the other end of the vessel. The vanes may also be worked by hand.

[Printed, 10*d*. Drawing.]

A.D. 1855, March 2.—N° 465.

JOHNSON, JOHN.—"Temporary rudders."

Iron U-shaped pieces are used, the sides of which are of sufficient length to equal the breadth of the rudder. Several of these are braced together by cross-bars of iron so as to form a skeleton frame of the shape of a rudder. In this space planks of wood are placed and secured by cross pieces at the ends of the U's. The lowest U may have a curved heel to fit on the sternpost. The whole when complete is to be lowered into position and lashed there.

[Printed, 8*d*. Drawing.]

A.D. 1855, July 20.—N° 1646.

DESCHAMPS, CASIMIR, and VILCOQ, CHARLES.—"Free "diving boat."

A submarine boat is described. It is steered by a rudder the shaft of which is pivotted between arms above and below at the stern of the boat. The rudder is worked by gearing communicating with the interior of the boat where a shaft has

on it a tiller which is actuated by a rope carried forwards to the bows and worked by a treadle there.

The rest of the Specification does not concern this series.

[Printed, 6*d*. Drawing.]

A.D. 1855, July 21.—N° 1659.

HEPPLEWHITE, GEORGE.—"Spare rudders."

A standard is erected on deck close to the trunk-hole of the rudder and has bearings at top and bottom to receive the shaft of the jury rudder. It has also a shoulder on which a roller on the rudder-shaft works, so as to support the weight of the rudder. This standard may either be bolted to the deck, or may pass a short distance down the trunk-hole. It is supported by stays from the gunwale. The rudder may be of two sorts. The shaft may be grooved at its lower part, and have fitted in the groove iron plates or wooden planks to form a rudder. These are bolted to the shaft and secured together by cross pieces or by bolts. It is passed over the side and then shipped in its bearings from below, or the shaft is made in two pieces with a socket joint. In this case the upper part is shipped in its bearings and the lower part fitted thereto. Also the rudder may be formed with radial plates like a fan, pivotted on one or two pins on the shaft. These plates are expanded by chains from the deck, and are connected together and to the shaft by short chains, so that their expansion is properly regulated. Guys are attached to the bottom of the rudder-shaft and carried inboard.

[Printed, 1*s*. Drawings.]

A.D. 1855, July 27.—N° 1708.

BENFIELD, JOHN AARON.—"Propelling vessels."

A boat is to be propelled by a screw set in the rudder and actuated by manual power. It is stated that one man will be sufficient, who is to turn a handle operating a series of multiplying wheels the number of which varies "according to power "of propulsion required."

The screw shaft has a universal joint on it between the rudder and the stern. The screw is set in the rudder so as to be readily removed, when the space can be filled up with a *piece of wood*. There is a brace with a circular plate "on the

" top of the rudder, furnished with small rollers to allow of " the free motion of the rudder." To fix the rudder in any position there is a quadrant to which the tiller may be secured by a screw in any position. The inventor also describes "a " method of checking the commotion of the water on canals, " by fixing on the rudder a forked piece of metal having arms " fixed thereto, with graduated holes therein; two wings " (curved if required) are placed on each side and above the " screw."

[Printed, 8*d*. Drawing.]

A.D. 1855, August 23.—N° 1908.

PAROD, ERNEST.—(*Provisional protection only.*)—"Steer- " ing of steam and other vessels."

The following is the whole Provisional Specification :—" My " invention consists in the application of the screw to the direc " tion of steam & other vessels. The screw propeller is so placed " on a shaft that it can take an oblique or perpendicular posi- " tion to the axis of the vessel, & consequently pushes the " stern of the vessel according to the said oblique or perpen- " dicular direction to the axis of the vessel, & by such means " all the power of the propeller is transferred to the point " where its application is useful for steering. By such a " system the vessel can tack about within 2 or 3 seconds, & " change suddenly its direction without having to describe long " curves, as it is the case for vessels having the screw in the " same direction as that of the keel. The shaft of the screw " is displaced by the helm; any mechanical means can be " employed for putting in motion the moveable shaft of the " propeller."

[Printed, 4*d*. No Drawings.]

A.D. 1855, August 23.—N° 1912.

KIDMAN, WILLIAM.—"Tillers or yokes."

The object of the invention is to take up the slack of the steering chains, and it consists in "making the standing part " of the steering rope or chain fast to the tiller or yoke, the " rope or chain being then led through side sheaves or blocks " to single or double sheaves or blocks in the tiller or yoke, " *and then*" through other similar blocks to the barrel of the

steering-wheel. The application is the same with a tiller or a yoke except that in one case the fixed blocks are attached to the sides of the vessel and in the other to a beam across the vessel in front of the yoke. The chain is attached to the tiller, &c., by a lashing or by a screw shackle, so that any slack may be taken up.

[Printed, 6*d*. Drawing.]

A.D. 1855, September 5.—N° 2010.

PALMIÉRI, AGOSTINO, and FERRARI, JEAN BAPTISTE.—(*A communication from J. B. Paganini.*)—"Construction of "ships."

A vessel is described which is mounted on rollers by the rotation of which it is propelled. A similar rotating disc is mounted at the stern of the vessel in a frame which can be turned from side to side by a segmental rack gearing with a pinion driven by a winch handle. By this means the vessel is steered. The rotatory motion is given by an endless band from a shaft driven by a steam engine or other motor.

[Printed, 10*d*. Drawing.]

A.D. 1855, September 5.—N° 2012.

PEACOCK, GEORGE.—Ship-building.

The first part of the invention relates to the addition of a false horizontal keel at the bottom of the true keel. This appendage is secured by angle-irons to the keel, and is tapered off forward.

In vessels having two stern-posts with the propeller between them, the after stern-post which carries the rudder is V-shaped, and the rudder is hung in the angle. The post is generally of iron and the gudgeons for the rudder pintles are rivetted thereto.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1855, October 1.—N° 2182.

WILKINSON, GEORGE.—(*Provisional protection only.*)—"Steering apparatus."

The entire Provisional Specification runs as follows:—"This "invention has for its object a peculiar combination of "*mechanism* for steering, for which purpose the upper part of

" the rudder or rudder post has fixed horizontally on it a cog " wheel, with interior teeth, which do not extend all round the " circumference. On a horizontal axis is fixed a portion of a " two-threaded screw of such diameter as to be equal to the " interior diameter of the cog wheel. The steering wheel is " fixed on the axis of the screw. By this combination, when " one thread of the screw completes its action, the other thread " comes into position to prevent the rudder going or being " driven over too far."

[Printed, 4*d*. No Drawings.]

A.D. 1855, October 8.—N° 2246.

HENRY, JAMES HARVEY.—(*Provisional protection only.*)—" Floating vessels."

The vessels are "supported above the surface of the water " by means of hollow cylindrical floats, with curved ends, " free to revolve on their axles, such vessels being by pre- " ference propelled by paddle wheels." "The guiding is " by preference to be accomplished by a rudder or rudders " about midships, in order that the vessel may go either end " forwards."

[Printed, 4*d*. No Drawings.]

A.D. 1855, October 15.—N° 2301.

MICKLETHWAITE, JOHN.—(*Provisional protection only.*)—" Propelling and steering vessels."

The following is the whole Provisional Specification :—" My " invention consists in propelling vessels by means of air forced " against the water in a direction contrary to that in which the " vessel is desired to be propelled. In order to steer vessels, I " force air through a nozzle or pipe, which can be so directed " as to turn the vessel in the direction required; or, instead of " a nozzle or pipe, I employ vanes, or curved passages, or " other means of giving direction to the air issuing from the " vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1855, October 27.—N° 2398.

WYATT, HENRY.—" Apparatus for more especially and per- " fectly manœuvring or steering steam ships of war or of " *commerce and is* entitled the transpulsor."

No description of the invention is given in the Specification, but it appears from the drawing to consist of a screw propeller, the shaft of which is mounted at its after end in a sort of skeleton rudder, and has a universal joint on it close to the propeller. The propeller can be used with or without a rudder. In the former case it is mounted in the usual position of the rudder; in the latter it is mounted in an aperture in the dead-wood in front of the rudder.

[Printed, 6*d*. Drawing.]

A.D. 1855, December 17.—N° 2855.

JOHNSON, JOHN HENRY.—(*A communication from Louis Frederic Francois David.*)—"Ships' tillers."

"The improvements consist in attaching two horizontal "arms, (at a slight angle to each other) to the rudder-head; "each arm carrying a pulley at its extremity, and an "adjustable means of attachment for the ropes or chains, so "that they may be taken up or let out as desired. A metal "frame, connected with the rudder-head by a solid or tubular "bar which fits loosely on the rudder-head as a pivot, serves "to carry a shaft; having fitted thereon either a fixed or "sliding spirally grooved barrel, on which the ropes or chains "are wound. This shaft carries also the steering wheel. A "cross bar fixed to the metal frame takes into the spiral "grooves of the barrel. The end of the shaft carrying the "barrel and steering wheel enters the end of the tubular bar "where a fixed barrel is used, so that when the barrel and "shaft are rotated to wind on the chain, the spiral grooves "or projections on the barrel, acting against the fixed cross "bar, will force the shaft carrying the barrel to slide longi-"tudinally in its bearings, the end of the shaft sliding inside "the tubular bar, and the barrel with its shaft shifting so as "to pay off the rope or chain on one side and receive it on "the other simultaneously at one point. The chains are "fixed to the ends of the arms and pass round pullies on the "metal frame, whence they return to pullies on the ends of "the arms, and after passing round these pullies, they "return back again to pullies fixed on the frame, which "pullies guide them on to the barrel to each end of which "*the two other* ends of the chains are attached. The steering

" wheel may be either placed in front of or behind the tiller, " by a slight modification of the apparatus. The arms on " the rudder-head are so arranged that when they are at the " centre of their traverse, that is to say, when the rudder is " amidships, their centre lines will respectively form right " angles with lines drawn from the respective centres of the " guide pullies on the metal frame to points on the respective " centre lines of the arms, such points being severally equally " distant from the arc described by the traverse of the " extremity of the arm and the chords of that arc.

[Printed, 10*d*. Drawing.]

1856.

A.D. 1856, February 9.—N° 345.

DUNCAN, JOHN WALLACE. — Steam engines, marine propellers, &c.

A method of shipping a propeller is described, so that it may stand at a slight angle to the keel while the shaft is horizontal. The shaft ends in a round boss which is grooved to receive a ring. On this ring a pair of trunnions is formed and on these another ring is fitted which carries the propeller blades. The whole arrangement is described as "forming a " kind of gimble." The outermost ring revolves between two fixed rings in the dead-wood, and the angle at which these are set controls the angle at which the propeller revolves.

To steer the vessel, instead of fixed rings there are rings " so fitted as to move round in either direction," and thus alter the direction of motion of the propeller. This is effected by two sets of racks and pinions actuated from the deck or elsewhere. The inclination of the propeller to the horizon may also be varied by a similar arrangement.

[Printed, 3*s*. Drawings.]

A.D. 1856, March 15.—N° 632.

PEGG, JOSEPH.—"Steering apparatus."

The object of the invention is to prevent slack in the tiller chains. A chain from a barrel on the steering-wheel shaft is led to barrels on parallel shafts at the sides, one end of the

chain being made fast to each barrel. On each of these shafts, at greater or less distance, according to the position of the rudder-head, is fitted a second barrel, from which a chain is led round a segmental-shaped tiller, the chain being fixed to the opposite side of the tiller by an adjusting screw.

[Printed, 8*d*. Drawing.]

A.D. 1856, March 26.—N° 726.

NEWTON, WILLIAM EDWARD.—(*A communication.*)—"Apparatus for exploring under water."

A submarine boat is described. It has an "ordinary rudder" at the stern, and an "up and down rudder" at the bow.

[Printed, 10*d*. Drawing.]

A.D. 1856, April 11.—N° 869.

BURNSIDE, JAMES.—"Propelling and steering ships and boats."

A vessel is propelled by frames on each side carrying floats, to which a parallel motion is given. The floats are fixed to rods, which are fixed at their ends to cranks, so as to be carried round and always kept in a horizontal position. Each frame carries two sets of floats, and they may be feathered for the return stroke by means of an eccentric, a grooved cam, or otherwise. It is said that "the arrangement of propellers" as described "may obviously be used for assisting in the steering "of ships by working them singly on either side of the ship." No special apparatus for so doing is described.

[Printed, 10*d*. Drawing.]

A.D. 1856, May 17.—N° 1178.

CARTER, GEORGE.—"Propelling and steering vessels."

A vessel is propelled by driving "air or water, or air mixed "with water" through tubes or along channels fitted to the bottom of the vessel, a principal object of the invention being to distribute the air as much as possible below the vessel, with the intention of rendering the vessel more buoyant. The outlets for the air, &c. may be closed by valves fitted with floats which act to close the opening whenever it is raised out of the water. "In addition to the usual rudder for steering, "*the stern* and likewise the bow of the vessel may be pierced

" with outlets, one on each side" "covered by slides or valves, " connected by suitable gearing to the steering apparatus."

The propelling machinery may consist of any suitable forcing or pumping apparatus.

[Printed, 8*d*. Drawing.]

A.D. 1856, May 20.—N° 1188.

WILKINSON, GEORGE.—Steering apparatus.

A ring with "internal inclined or oblique teeth" partly round its interior is fixed to the tiller head "by means of a half " spherical or hollow metal basin, the object being that such " basin may contain oil or lubricating matter. On the axis " used to give motion to the ring a disc is fixed, of a diameter " about equal to the diameter of the ring within the teeth " and on such disc are formed portions of the worms of a one " or more threaded screws (by preference a two threaded " screw);" and for the purpose "of steering, or other uses " where a reciprocating motion is desired, the axis of the disc " or screw may be across the centre of the ring." The ring may be fixed on the rudder-head, or on a shaft, whence motion is given by chains or otherwise to the rudder. "The advantage " of having the ring of oblique or inclined teeth fixed to a " hollow basin or vessel is, that the threads of the screw in " their rotation bring up lubricating matter contained therein " on their surfaces."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1856, June 24.—N° 1488.

NEWTON, ALFRED VINCENT.—(*Provisional protection only.*) —Life-boat.

A life-boat is described which is mounted on trunnions within a sort of frame capable of revolving round the inner vessel when struck by a sea. In this frame a rudder (amongst other appliances) is mounted, "and a toothed segment for working it." To allow for the revolution of the frame, the rudder "is " made so as to act in either position." "The working of " the rudder is effected through a rod which passes through " the hind trunnion, and is fitted at its inner end with a " steering wheel, and at its outer end with a bevel pinion in " gear with the segment rack on the rudder stern."

[Printed, 4d. No Drawings.]

A.D. 1856, July 1.—N° 1545.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication.*)—"Propelling and steering vessels."

Water is driven by means of a steam pump of suitable character along water-ways fitted from stem to stern. "Near "the head, and also near the stern, there are right angle "branch waterways." The outlets of all these are fitted with valves, by means of which the vessel may be propelled ahead or astern, or steered as required. No rudder is necessary. Full details of the pumping apparatus and the method of its working are given in the drawings.

[Printed, 2*s*. Drawings.]

A.D. 1856, July 4.—N° 1569.

BRADFORD, EDWIN GREENSLADE.—Rudders.

The invention consists in hanging the rudder "equally on "each side of a vertical" "axis, so that when turned at right "angles to the keel it shall offer an equal resistance on each "side thereof, and merely retard the vessel's progress." The rudder-stock works in bearings above, and below the rudder is pivotted on a central pin fitting in a slot in a spur projecting from the keel. This spur may be continued upwards to form a guard for the rudder. Or the rudder may be similarly fitted in a recess shaped for it. The rudder may be applied at the bows as well as at the stern.

[Printed, 8*d*. Drawings.]

A.D. 1856, July 26.—N° 1779.

PAULING, RICHARD CLARKE.—Constructing and propelling vessels, &c.

A vessel may be propelled by a jet of compressed air driven through tubes against the external water. The jet may be produced by a fan or "an air vessel with cylinders worked by a "steam engine." The tubes are laid horizontally along the side of the vessel, one on each side, opening to the water at the bows and stern, and there are connecting tubes leading from the fan, &c. and joining the horizontal tubes about midships. Valves are fitted at the point of junction, by which the stream can be directed either ahead or astern to steer the vessel.

[Printed, 1s. 2d. Drawings.]

A.D. 1856, September 11.—N° 2129.

CHAPLIN, ALEXANDER.—Ship-building.

A flat-bottomed vessel of peculiar construction is described. It, or any other vessel, may be steered by means of "two or "more plates or blades arranged obliquely either at the stern "or bow of the vessel. Each of these plates, which are in- "clined on opposite sides to a vertical plane supposed to pass "through the longitudinal centre line of the vessel, is arranged "to work in a vertical casing fitted in the end of the vessel and "opening below the water." Each plate is used alternately to turn the vessel as required. When she is going straight ahead, both plates are kept with "their bottom edges flush "with the bottom or side of the vessel." The plates may be worked in various ways. "According to one plan, the plates "are each jointed upon a fixed centre at one end, their free "end being connected to a wheel in such a way that as one "plate is hoisted up, the other is lowered down, the wheel "being worked like an ordinary rudder wheel." The plates may be fixed either at the bows or at the stern, or in both positions.

[Printed, 4*d*. No Drawings.]

A.D. 1856, October 1.—N° 2294.

HOLMAN, JOHN.—"Ships' rudders."

The rudder-stock is cylindrical and turns in straps fixed to the stern-post. The lower end of the rudder-stock steps in a bearing formed by a projecting spur from the keel. The upper part of the rudder-stock may be held in a tube fixed to the stern-post, or it may have on it a collar which works on a flange bolted to the deck. The straps supporting the rudder may be fixed to the stern-post and surround the rudder-stock, or they may be hinged and secured by a moveable bolt, or corresponding straps may be fitted to the stern-post and rudder-stock and have catches by which they are connected, or the strap on the rudder-stock may be loose so that it can turn therein, and may be attached by a catch to the strap on the stern-post. In shipping the rudder the former strap is held temporarily by a bolt. There may be a cap which folds down over the rudder-head to secure it, and below the rudder-stock may be surrounded by a ring carrying a feather which fits in a

groove in the stern-post. When a tube is used within which the upper part of the rudder-stock is held, it may be secured by a groove and feather or by a wedge and key. Lastly, the rudder may be secured by a rod passing down through eyes on the stern-post and the rudder-stock.

[Printed, 2*s*. Drawings.]

A.D. 1856, October 29.—N° 2541.

HENZELL, THOMAS SMITH.—Ship-building.

A vessel of peculiar construction is described. It is "furnished with sliding side keels or floats which can be hove "up and down so as to give less or more hold upon the water" as required. They slide in grooves in suitable casings, and are hove up and down by means of chains.

[Printed, 8*d*. Drawing.]

A.D. 1856, November 1.—N° 2564.

BROWNE, JOSEPH.—Capstans and windlasses, also apparatus for steering.

A capstan is described, the principle of which is also applicable to steering apparatus. Pinions on the steering-wheel shaft drive a pair of toothed wheels on a shaft below which have on the faces next each other circular cams. Between these the rudder shaft is carried up, and it is shaped so that the cams "give a vibrating motion" to it which works the rudder.

[Printed, 10*d*. Drawing.]

A.D. 1856, December 23.—N° 3049.

HEATHER, ALFRED.—"Ferry boats."

A ferry-boat is described. "At each end of the boat is a "case or trough through which a rudder descends." By means of a rack and pinion the rudder near that end of the boat, which is at the time the forward end, can be raised into its case, while, by a similar arrangement, that at the other end can be lowered so as to project entirely below the bottom.

[Printed, 10*d*. Drawings.]

1857.

A.D. 1857, January 1.—N° 4.

BOURNE, JOHN. — (*Provisional protection only.*)—"Steam "train for navigating shallow rivers."

Barges are connected together into a train by making the convex end of one barge fit into the concave end of that next it. The train is propelled by a steamer, preferably at the head of the train. The train may be steered by rudders at the bows and stern or by working the paddle wheels of the steamer separately, but the method preferred is to employ some "suitable deflecting apparatus" between the terminal barges and those next them, or between every two barges of the train, so that the ends of the train, or the whole of it, may be made to curve. There is a rudder "on each side of the steamer near "the stern," and these can be used when the steamer is detached from the train. When it is connected thereto, each rudder "usually lies inoperative against the ship's side."

[Printed, 4*d*. No Drawings.]

A.D. 1857, January 10.—N° 96.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from François Jeandeau*). — (*Provisional protection only*). — "Propelling ships, boats, and other vessels."

The following is the whole Provisional Specification :—"This "invention consists in fitting to the bow or other suitable part "of a ship, boat, or other vessel two submerged wheels of a like "diameter, fitted with an equal number of blades, and placed "horizontally and in such manner that an imaginary line "connecting their centres would intersect at right angles the "axis, or a line drawn from stem to stern of the vessel. The "wheels are fitted within semi-cylindrical cases or half drums, "or cases enclosing one half or a portion of their peripheries, "and are made to rotate at the same rate of velocity by means "of cranked arms worked by the piston rod of a steam engine "or otherwise. To propel the vessel the wheels are driven in "relatively reverse directions, while to turn or steer her they "are rotated in the same direction. Instead of two wheels, a

" single submerged wheel fitted with blades enclosed in a " half or segmental drum and placed horizontally may be " employed."

[Printed, 4*d*. No Drawings.

A.D. 1857, January 13.—N° 104.

BOWER, ALFRED.—Keels.

The objects of the invention are to give sailing vessels "a " greater hold of the water, to enable them to go with greater " facility to 'windward,' increase their stability under canvas, " and improve their steering qualities." This is effected by " increasing the width of the lower portion or the base of the " keel, for (say) about three-fourths or four-fifths of the centre " portion of its length, causing the oblique or angular sides " to gradually diminish and die away towards the extremities." The section of the keel may thus be of a "truncated pyra- " midical or double truncated pyramidical form" or other suitable shape. Numerous illustrations are given in the drawing of the various shapes the keels may assume.

[Printed, 8*d*. Drawing.]

A.D. 1857, February 12.—N° 412.

TURNER, THOMAS, and BOYENS, HENRY. — (*Provisional protection only.*)—"Improvements in apparatus for steering " ships and vessels, and in apparatus for communicating or " signalling between the deck and engine room of steam " vessels."

In constructing steering apparatus according to this invention "the rudder post head is fitted with two arms, to each of " which a chain or band is attached. The ends of these " chains or bands are fixed to two barrels. The chain or " band of one arm passes under its barrel, and the other chain " or band passes over its barrel. The two barrels are fixed on " the same shaft or axis. Between the two barrels a screw " wheel is fixed on the shaft or axis. Motion is given to the " two barrels by means of a worm or screw, fixed on a shaft " at right angles to the axis of the barrels, and on such shaft " the steering wheel is fixed."

[*Printed, 4d. No* Drawings.]

A.D. 1857, March 4.—N° 630.

BODMER, RUDOLPH.—(*A communication from John Dominick Ghersi.*)—Steering ships.

Additional rudders are fitted at the bows and stern. At the stern an additional rudder is fixed on each side of the stern-post in the same gudgeons as the ordinary rudder. It lies forward in a recess in the dead wood and has steering gear of its own attached to it, either a simple tiller, or a wheel of the usual sort. When not in use it is held fast to the ship's side by a pall taking into a ratchet wheel on the shaft. Similar rudders are fitted on each side of the bows, and they may have their shafts at either their forward or aft edge. To obtain room for the two steering apparatus, the shafts may have universal joints.

Instead of the above, "fins" pivotted on a horizontal shaft at the stern or bows may be used, one at each end. By means of suitable fins each "fin" can be turned to either side of the revolution of its shaft. When not in use, it may lie in a line with the cutwater or stern-post or in a recess formed for it, either above or below its axis.

[Printed, 10*d*. Drawing.]

A.D. 1857, March 9.—N° 688.

NEWTON, WILLIAM EDWARD. — (*A communication.*) — "Steering apparatus."

The steering-wheel is mounted on a standard on the rudder-head. The other end of the shaft is supported in bearings on the tiller, and on this end there is a pinion engaging with a pinion on an upright shaft. This upright shaft has at its lower end a pinion which engages in a toothed arc bolted to the deck, this arc being a portion of a circle whose centre is the centre of the rudder-head. This latter shaft works in bearings carried by a bracket attached to the end of the tiller which is below and parallel to the steering-wheel shaft. In order to admit of a brake arrangement this bracket is pivotted to the tiller, not fixed firmly thereon, so that by means of a lever actuated by a treadle near the steering-wheel, the pinion can be jammed hard against the arc and the two upper pinions jammed together, and the rudder thus fixed in any required position. To receive any pressure exerted by the gearing

against the rudder-head, there is a roller thereon which works against a piece fixed behind the rudder-head, and the rudder-head is thus preserved from any horizontal thrust.

[Printed, 8*d*. Drawing.]

A.D. 1857, March 9.—N° 689.

NEWTON, ALFRED VINCENT.—(*A communication.*)—Rudders.

An additional piece is attached to the bottom of the ordinary rudder so that it may be let down or drawn up as required. This additional piece has a stem by which it is pivotted to the bottom of the rudder. It is raised against the after edge of the rudder by a rope, and falls by its own weight. To make it balance properly the portion aft of the rudder is heavier than the forward portion which lies under the keel. The foot of the rudder is curved to allow the moveable part to work freely upon it.

[Printed, 6*d*. Drawing.]

A.D. 1857, March 31.—N° 891.

GRAHAM, JOHN.—"Steering apparatus."

A drum on the steering wheel shaft gives motion by an endless chain to a drum below. On the shaft of this second drum is an endless screw which engages with a cog-wheel on an eccentric grooved pulley, chains from which pass over an eccentric arc on the rudder-head. The eccentricity of the arc and the pulley are such that the chain is always kept taut, as it uncoils from one and coils on to the other. The chains can be tightened by adjusting screws on the arc, to the ends of which screws the chains are attached.

[Printed, 6*d*. Drawing.]

A.D. 1857, June 9.—N° 1615.

NEWTON, WILLIAM EDWARD.—(*A communication.*)—Lifeboat.

This consists of "a car, vessel, or boat" supported upon the elevated prow-shaped ends "of two hollow closed air-tight "floats. This vessel is supported at the ends and at various "points in the length of the said floats, which are placed "*parallel to each* other." Between the floats is a paddle

wheel. A rudder mounted in a frame is adapted to one end of the vessel, and works under the "car." Its stern-post is carried by the floats, and its tiller is inclined upwards apparently through the bottom of the "car."

[Printed, 6*d*. Drawings.]

A.D. 1857, June 10.—N° 1634.

NEWTON, ALFRED VINCENT.—(*A communication.*)—"Construction and mode of propelling and steering navigable vessels."

A vessel with vertical sides and flat bottom is shaped like a triangle, with the vertex for the bow and the base at the stern. "The improved system of propulsion" "consists in the expulsion of air from a chamber or chambers within the stern of the vessel, through an opening or openings extending the entire width of the stern below the surface of the water, by pressure, to which the said air is subjected by a compression pump or pumps, or which is developed by its expansion by heat." "This system of propulsion also consists in certain provisions for expelling air in a forward direction from the vessel, to act on the same principle as above stated, for the purpose of propelling the vessel in a backward direction." This air is expelled from openings in the side of the stern chamber, but near to its foremost end. The mode of steering such vessels is by means of "one or more rudders operating within the air chamber in the stern of the vessel, to give direction to the escaping air which is the propelling agent, and thus direct the motion of the vessel." The rudder is fitted in the usual way on a vertical rudder-stock about the centre of the chamber. The blade is on both sides of the stock, the part astern being a little larger than the foremost part. It is operated by the usual steering apparatus.

[Printed, 8*d*. Drawing.]

A.D. 1857, June 26.—N° 1795.

BOURNE, JOHN.—"An improved steam train for navigating shallow rivers."

Boats are attached in trains by articulating the bow of one to the hollow stern of the next. The first vessel of the train is a steamer propelled by screws or paddle wheels at the sides

or bow which act on the water or bottom, or by jets of water. The train is steered by rudders "at the bow and stern," or by a pair of paddle-wheels worked by separate engines, or preferably by altering the relative position of the boats to one another. This may be effected by a chain leading from a steering wheel on the steamer to the next or any other barge by which the steamer can be brought to any angle therewith. Similar apparatus may be used to alter the position of any two vessels of the train. Any other suitable "deflecting apparatus" may be used. "On each side of the steamer near the stern" there is a rudder. These are used when the steamer is detached from the train. When it is attached thereto they lie "inoperative "against the ship's side." A pole may be lowered at the stern of the last boat to hold it back when the train descends a rapid stream.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1857, July 8.—N° 1903.

MOORE, ROBERT.—(*Provisional protection only.*)—"Navig-"able vessels, and the propelling thereof."

The only part of the Specification connected with this series is contained in the following extracts :—"I partially lower and "raise the shaft and screw to vary the elevation of the axis "of rotation for the purpose of working in deep or shallow "water." "This is done by having an adequate vertical "passage in the stern post made water-tight by any suitable "means ; and in cases when the shaft is used abaft the rudder "I make the corresponding arrangements in the rudder and "after shaft bearing ; I also effect the same object by partially "lowering and raising the entire of the frame in which is set "the after part of the screw shaft, rudder, and screw. I also "propose to raise the screw on deck, and lower it in connexion "with a part of the shaft by means of an appropriate frame, "and in so doing I swing forward the rudder, which is "specially adapted for that purpose ; I also disconnect the "screw, when employed abaft the rudder, from its shaft for "the usual objects for which it is required to be unshipped "and hoisted on deck, and raise and lower it by bar links, "with any suitable mechanism for steadying and securing "the screw."

[Printed, 4*d.* No Drawings.]

A.D. 1857, July 21.—N° 2013.

MOHR, JOSEF.—(*Provisional protection only.*)—Propelling vessels.

A ship is propelled by the action of a jet of water produced by a turbine, and expelled through openings at any suitable parts of the vessel. These openings are fitted with valves "by opening or closing which the direction of the current of "the water may be changed as required, so that the vessel may "be moved ahead, astern, or sideways as required." "Instead "of valves there may be a moveable internal casing provided "with suitable apertures, so that by turning this casing on "its centre, one of the exit apertures may be brought opposite "to either of the exit channels."

[Printed, 4*d*. No Drawings.]

A.D. 1857, August 10.—N° 2143.

RENTON, AMHERST HAWKER.—(*A communication from Hippolyte Perie, Emile Bellamy and Francois Sterling, jun.*)—"Steering vessels."

A cog-wheel on the shaft of the steering-wheel engages with pinions, one on each side on the end of a horizontal shaft with an endless screw thereon. These screws, which are right and left handed respectively, engage with a cog-wheel on the top of the rudder-head. To allow of the rudder rising without injuring the gearing, this wheel is not fixed direct on the rudder-head, but a square shaft on the rudder-head passes through a similar hole in the centre of the wheel. At the top of the case in which the gearing is contained may be fixed an index showing the position of the wheel.

[Printed, 10*d*. Drawings.]

A.D. 1857, September 8.—N° 2344.

GEACH, WILLIAM.—"Propelling vessels."

A cylindrical case is fixed under water at the after part of a vessel (the axis of the cylinder being vertical) within which a wheel with float boards is caused to revolve and eject the water entering by an opening in the bottom through an outlet in the side of the case so as to propel the vessel. The case may be turned round by means of suitable gearing so as to cause the stream to issue in any direction required for steering. The

case can be raised out of the water when required. The apparatus is driven in any convenient manner from a steam engine.

[Printed, 6*d*. Drawing.]

A.D, 1857, September 11.—N° 2371.

LUNGLEY, CHARLES.—Signalling on board ships, &c.

An apparatus is described by which the officer in charge can telegraph from different parts of the ship to the steersman. In order that he may be able to know whether his orders have been obeyed, the motion of the tiller is conveyed by means of an arrangement of rods and bell-cranks to an index finger placed in any convenient position in the ship. Other devices for signalling at sea are also described.

[Printed, 1*s*. 6*d*. Drawings.]

A.D, 1857, September 22.—N° 2454.

HENRY, MICHAEL.—(*A communication from Robert Tissot.*) —(*Provisional protection only.*)—"Improvements in the "mode of transmitting motion, especially applicable to appa- "ratus employed in navigation."

The screw propeller shaft is in two parts, connected by a link, so that the screw can be worked in various positions, and used for steering the ship. The required movement can be transmitted to the propeller by any suitable means; it "may be "conveniently actuated for steering purposes by causing its "bearing or frame to travel on arms fixed to the vessel by "means of a toothed segment or wheel, which it carries, being "geared into by a toothed pinion worked from the deck."

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 8.—N° 2578.

REUVER, DANIEL.—(*Provisional protection only.*)—"Pro- "pelling and steering ships."

The entire Provisional Specification is as follows:—"The "improvements relate to an adaptation of means which, whilst "capable of being used to propel in either direction the ship "or other vessel to which they are applied, are also arranged to "be used for the purpose of steering the same in place of using "rudders for that purpose. To lever arms are hinged wings

" or flaps, which during movement in one direction of such " lever arms are capable of opening to act upon the water for " a progressive motion, and during the movement in the " opposite direction of closing that they may more readily " pass through it. These lever arms are supported each in a " collar carried by a swinging frame, and at their upper ends " are by adjustable means connected to rods actuated by a " steam engine or other power, to give the necessary to-and-fro " motion to them. Each lever arm at the point of support " has affixed to it a pinion which is operated by a rack or such " like means, by which the propellers may be turned round " to propel in an opposite direction, or only partially so when " they are used for the purpose of steering."

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 31.—N° 2765.

GALLOWAY, GEORGE BELL.—Construction and propulsion of vessels, &c.

Various improvements in ship-building are described. Also some propellers called " fish fin " and " fishes tail." A method of hydro-propulsion is also described. A series of pumps is arranged along a tube in a vessel, into which water is admitted to compress air in the pumps. This air is then allowed to pass out through pipes to propel the vessel, or received into a " cistern," into which water also is admitted from outside the vessel. The cistern " is fitted with two or more powerful " springs adjusted and placed upon the top of valves, and " when the pressure of the water or air or both shall be of " sufficient strength to lift those valves, it will then escape " through the exit pipes and produce its propulsive effect." It is also said that the " power thus concentrated and produced " within this cistern " may drive hydraulic engines to be used in some way not explained for propelling.

For steering, valves are fitted to the tubes and these may be operated from deck, so as to regulate the discharge of water.

There is a drawing attached to the Specification in which an " additional rudder " is shown. It looks as if it were intended to govern the direction of a jet from one of the tubes, but there is no description.

[Printed, 8*d*. Drawing.]

A.D. 1857, November 6.—N° 2820.

MACNAB, WILLIAM.—Screw steamers.

A vessel is constructed with two stern-posts, between which two propellers work. A rudder is mounted on each stern-post. In larger vessels there may be three stern-posts, and four propellers, two on each side the central stern-post. In this case there is only one rudder, and it is placed on the central stern-post.

[Printed, 10*d*. Drawing.]

A.D. 1857, November 21.—N° 2922.

COOPER, WILLIAM ARCHIBALD.—"Navigation of steam and "other vessels."

Tubes lead from a steam boiler to outlets on each side at the bows and stern. The vessel is propelled or manœuvred by the force of a jet of steam issuing from these tubes. The tubes are furnished with cocks near their connection with the boiler, and these cocks are worked by rods, and so that they may all be conveniently actuated from the same part of the vessel. The tubes have also cocks near their outer ends, so that they may be closed when not in use.

[Printed, 4*d*. No Drawings.]

A.D. 1857, December 23.—N° 3149.

NIXON, CHRISTOPHER NUGENT.—Hanging rudders.

Various methods of securing the rudder are described, the object of which is to allow the rudder to rise and fall without being unshipped.

1. For boats. A bar is fixed along the stern-post, and the gudgeons on the rudder are slotted so that they may pass over the braces which support the bar. The top gudgeon is not slotted, but rests on the top brace.

2. For boats. Slotted gudgeons are fixed on the stern-post, and a "double-braced" pintle is fitted to the rudder at its lower part. There is also a small gudgeon at the top of the rudder, which passes over a pintle on the stern-post.

3. For ships, barges, and other vessels having "square-"headed rudders." A "double-braced" pintle is fitted on the lower part of the rudder. This is notched, just above the lower brace, to allow it to pass into a slotted gudgeon on the *stern-post*. The pintle projects below the lower brace, and

this part fits into a socket on the stern-post. A similar pintle is fitted to the upper part of the stern-post, and works in gudgeons on the rudder. A strap pivotted on the stern-post folds down on the top of this pintle, and has also on it a pin which fits in a hole in the top gudgeon on the rudder.

4. For "ships and other vessels which have circular-headed "rudders." The rudder is fitted, a short distance from its lower end, with a pintle hollowed out, so that after passing through a gudgeon on the stern-post it may receive within it a pintle, turned upwards, on the stern-post, which also passes through a gudgeon on the rudder. Above the rudder is held by a "chock brace" or collar, in which the rudder-head may slide for a certain distance. This "chock brace" is hinged to the stern of the vessel, so that it can be raised to unship the rudder.

5. For iron ships. Metal braces are fixed on the stern-post and the rudder, "those on the rudder having tongues formed "at the back part thereof to guide the rudder post," which is of metal, and has "a groove at the back of sufficient length "corresponding to" the tongues. "The rudder post is "passed from above through the said braces, thus connecting "the rudder with the stern-post, and stepping into the lower "brace of the rudder, the bottom of which terminates in a "pivot." To allow the rudder to rise, "those parts thereof "which are adjacent to the braces attached to the stern-post" are cut away.

6. The tiller or yoke is secured to a collar, within which the rudder may slide, this collar being firmly secured to the deck in such a way that it can revolve, but cannot move upwards or downwards. The object of this is to prevent the tiller being affected by the rising or falling of the rudder.

[Printed, 1*s*. Drawings.]

1858.

A.D. 1858, January 20.—N° 94.

NIXON, CHRISTOPHER NUGENT. — "Application of screw "power."

One of the principal applications of the power is to steering. A toothed wheel on the steering-wheel shaft engages with a pinion on each side, on the shaft of which is an endless screw engaging with a toothed wheel on the rudder-head or on a shaft connected to the rudder-head by chains or levers. In either case the rudder-head is fitted to slide vertically in a collar, so that the rudder may rise and fall without injuring the gearing. Instead of having two endless screws, a single endless screw on the shaft of the steering-wheel may drive a toothed wheel as above.

A brake may be used with the rudder. Teeth are formed on the collar, in which the rudder works, and a rack may be thrown into or out of gear with these teeth, so as to fix the wheel. The rack is to be actuated by a treadle near the steering-wheel.

Instead of cogs, "friction teeth" may be used. These are "short bars of metal arranged on the periphery of the collar "or wheel, the respective ends of such bars being secured "in holes constructed in rims" on the wheel, "and free to "revolve therein."

[Printed, 10*d*. Drawing.]

A.D. 1858, April 20.—N° 869.

RAWSTORNE, JAMES. — (*Provisional protection only.*)— "Means for stopping or retarding the progress of ships or "vessels."

For this purpose moveable fins or floats are arranged so as to be "capable either of being lowered into the water, or being "opened out when required," and afterwards raised or folded up. For steering, these fins are to be used separately on different sides of the vessel. They may be actuated by hand or by the engine. The invention is specially applicable to screw steamers.

[Printed, 4*d*. No Drawings.]

A.D. 1858, April 23.—N° 903.

LUNGLEY, CHARLES.—Ship-building.

Vessels with a screw propeller are fitted with two rudders, one on each side of the propeller. These rudders are hollow to allow the water to pass through them. They are mounted

so that one only is used at a time. To this end they are provided "with a tiller having a double fulcrum." This tiller consists of a "three-armed lever, the forward limb of which "works in a double segment guide." Fixed on deck to each of the other arms is pivotted a lever-arm, the other end of which is pivotted to a fixed point on the opposite side of the tiller. Each of the two arms of the tiller has also on it a socket which slides on an arm or tiller affixed to the rudder on that side. The effect of this is that when the tiller is put over to either side it brings into action the rudder on the opposite side, but does not affect that on the same side. A rudder of the ordinary description may be fitted to each end of a vessel, the post on which the rudder is hung being sufficiently distant from the end of the vessel to allow the rudder to swing completely round when that end is going forward. The forward edges of the rudders are bevelled off so as to oppose little resistance to the water. The tiller is to be fitted so that by unshipping it the rudder will be allowed to swing round.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1858, June 19.—N° 1386.

WINANS, Ross, and WINANS, THOMAS. — "Form of the "hulls of steam vessels."

A vessel with a "spindle-shaped" hull is described. "Vessels of such a form might be steered in more convenient "ways than by the use of the ordinary rudder; one plan for "this purpose is as follows:—At some suitable point along "the length of the vessel, either before or abaft the centre, "a vertical shaft should be passed through a stuffing box in "the bottom or through a pipe projecting from the bottom "into the interior above the water line. At the lower end of "this shaft a blade of sufficient size should project, which "should be symmetrical on both sides of the axis of the "shaft and sufficiently curved or sloped on its top to enable "it to make an entire rotation without touching the curved "bottom. More than one such rudder might be provided or "placed in different positions. The upper end of the shaft "should be connected with a tiller, wheel, or other steering "apparatus."

[Printed, 8*d.* Drawing.]

A.D. 1858, October 4.—N° 2205.

TREVITHICK, FRANCIS.—"Applying sails and keels to boats "and vessels."

"In applying keels to boats or vessels, fixed tubes are used "at intervals, parallel with the centre or keel of flat-bottomed "boats or vessels; through these tubes chains or cords are "passed to which the keels are attached, and other cords or "chains pass over the sides of the vessels, which are also "attached to the keels, and by which the keels may be lifted "into the vessel, or be brought to act as lee boards."

[Printed, 10*d*. Drawing.]

A.D. 1858, October 12.—N° 2274.

BEADON, GEORGE.—Construction of ships, &c.

Among the improvements mentioned is one referring to a "loom or tail propeller for the purpose of steering and pro-"pelling." There are also "side fins for stopping or steering "a screw vessel." No description of either of these is given, but two of the side fins are figured in the drawing. They appear to consist of curved plates hinged to the vessel's side near the stern and projected therefrom by means of a quadrant-shaped arm affixed to the centre of the fin, and working through the side.

[Printed, 10*d*. Drawing.]

A.D. 1858, October 14.—N° 2298.

NEWTON, WILLIAM EDWARD.—(*A communication.*)—"Cabin or state room for steam boats and other vessels."

An air-tight cabin is described, so constructed that in case of the vessel sinking the cabins may float free from her, and serve as rafts or separate vessels. The cabin is provided with paddles so arranged that they can be slidden in and out through suitable apertures without admitting water. At each end of the cabin a rudder is fitted so that it can be folded back against the end of the cabin when not in use, or dropped down so as to hang below the bottom. A tiller is attached to each rudder-head and works in a metal box fixed on the exterior. A connecting rod passes to the inside of the cabin, and by securing this by a pin to any one of a series of slots in a metal plate, the rudder may be held in any desired position.

[Printed, 10*d*. Drawing.]

A.D. 1858, November 8.—N° 2496.

MAC SWENEY, THOMAS.—Steering apparatus.

The object is to "give motion to the rudder by the friction "of rolling surfaces." The steering-wheel shaft passes directly over the centre of the rudder-head, on which is fixed, by means of a cross bar, a ring with a bevelled surface, and above this is fixed a similar ring, the two bevelled surfaces being next each other. The steering-wheel shaft passes between these and has on it two conical projections where it crosses the rings. The shaft is fitted so that one of these cones works against the upper and one against the lower ring, thus causing the rudder to work when the shaft is revolved. Above one of these cones and below the other, on the opposite side, that is, to that which rests against the ring, are two conical rollers which are connected by a cross-piece and bear against a shoulder on the shaft, these rest against the ring (either upper or lower) which the shaft itself does not touch.

[Printed, 6*d*. Drawing.]

A.D. 1858, November 9.—N° 2507.

HENDERSON, ANDREW.—Rudders.

A chamber is formed at each end of the vessel into which the rudder can fit, and from which it is lowered when in action. The shaft passes up through the hull, and the rudder is entirely below water. Its vertical breadth is somewhat less than its horizontal, and it is fixed to the shaft at a point preferably about a third of its length from its forward end. The shaft slides in guides, and has a collar on it which rests on a flange at the bottom of the guides. At a higher point it has formed on it a screw with a nut on it, by which the depth to which it can descend may be regulated. In other respects the bow and stern rudders are similar, but the shaft of the stern rudder at its upper part can slide in a groove parallel with the keel so that the angle it makes with the keel can be varied. When brought into the required position it can be fixed by a bolt.

Tiller chains from each rudder can be brought to a steering-wheel amidships or elsewhere, and the chain which works the bow rudder can be thrown out of gear, so that the rudder is not brought into action.

[Printed, 10*d*. Drawing.]

A.D, 1858, November 11.—N° 2531.

MABERLY, FREDERICK HERBERT.—Ship-building.

A vessel of peculiar construction is described. It is propelled by paddle wheels, and the steering is effected by altering the direction of the paddle-wheel by means of a clutch-box. This clutch can be actuated from the deck by a lever, and there may be rods projecting forward and below the bottom, to reverse the action of both wheels whenever either rod comes in contact with any substance.

[Printed, 1s. Drawing.]

A.D. 1858, November 22.—N° 2651.

NEWTON, ALFRED VINCENT.—(*A communication from Samuel Huse and Samuel Huse, junior.*)—"Propelling and "steering vessels."

The object of this invention is to effect the steering of the vessel by the propeller. "To the stern of the vessel a vertical "post is attached by straps. To this post is suspended, by "similar straps, the rudder, which forms a frame within "which the propeller is mounted. The propeller receives "rotary motion through bevil gear from the main driving "shaft, the vertical post forming the axle for the middle bevil "wheel. For the purpose of resisting the thrust of the pro-"peller, and effectually preventing the parts from being "strained and thrown out of position, the vertical post is "caused to bear upon the stern-post the whole of its length, "except where the latter is necessarily cut away to accom-"modate the gearing. The portion of the shaft thus left unsup-"ported is surrounded by a sleeve, against which the end of "the propeller shaft is allowed to bear; the whole end thrust "of this shaft is thus transferred to the sleeve, and through "the vertical post to the stern." For the purpose of moving the rudder the following device is employed:—"Projecting "rearward from the rudder is a tiller to which is secured a "beam, the exterior surface of which is the arc of a circle, the "centre of which is the centre of the vertical post. The tiller "passes through the centre of a cylindrical india-rubber "spring contained within a rectangular box or case, to the "ends of which are secured, by staples, the ends of the tiller "*rope or chain.*" "This rope or chain, starting from one

" staple, passes over a guide pulley along the edge of the " curved timber, and thence by other guide pullies to the " steering-wheel, then back over similar guide pullies over the " curved timber to the staple on the opposite side of the spring " box, thus the spring is interposed between the tiller and " either end of the box, to which is secured the tiller rope, and " the steering apparatus is relieved from the heavy blows and " shocks to which the rudder is subjected by the waves."

[Printed, 10*d*. Drawings.]

1859.

A.D. 1859, January 8.—N° 66.

DELANY, WILLIAM.—(*A communication from Lodner D. Phillips*). —(*Provisional protection only.*) — "Submarine " boats or vessels."

A submarine boat is described fitted with various apparatus for working under the surface of the water. "Through one " end of the vessel a hollow shaft passes by a ball-and-socket " joint, and on this shaft a rudder is mounted; beyond the " rudder there is a screw propeller which is driven from the " interior by an axis passing through the hollow shaft of " the rudder; by this propeller the vessel may be propelled " in any desired direction. A similar screw may be placed at " the other end of the vessel." The propeller may be worked by a steam engine when the boat is at the surface. It is not stated what motive power is to be used when the boat is under water.

[Printed, 4*d*. No Drawings.]

A.D. 1859, January 12.—N° 92.

OLIVER, WILLIAM.—"Improvements in boats and in the " mode of propelling them."

A boat is propelled by paddle wheels at the side, actuated by a crank-shaft across the boat worked by treadles. Behind the crank-shaft is a seat for the operator and near the seat are handles by means of which clutches on the shaft may be caused

to throw either or both paddles out of gear as required. A lever handle can also operate a "shifting plate or bar for "changing the centres or position of the treadles, and re- "versing the action of the paddles." By this means the paddles can be used for steering. The yoke lines are carried round over pulleys, and brought in front of the operator, who sits with his face to the bow.

[Printed, 6*d*. Drawing.]

A.D. 1859, January 17.—N° 137.

MONTGOMERY, James.—Ship-building, propulsion, &c.

Among the numerous improvements described in the Specification is one for steering by the propeller. The propeller is mounted in a cylinder to which a turn-table is fitted. By suitable gearing from the propelling or any other engine this turn-table can be revolved so as to set the propellor at any required angle with the keel. A vessel may be fitted "with "a single propellor of this kind placed amidships or having "one propellor fore and the other aft." "Two such pro- "pellers revolving in opposite directions can be made to "rapidly turn a vessel in her own length." One or more such propellers may "aid or entirely supersede the steerage duties "of the rudder."

[Printed, 6*s*. 6*d*. Drawings.]

A.D. 1859, February 10.—N° 378.

STOCKS, George Louis.—(*Provisional protection only.*)—"Steering apparatus."

1. "A lever working a bar or shaft" passes "through the "rudder head and underneath the tiller, having its bearing "at one end on the rudder head and the other on the end of "the tiller or yoke attached to the end of the bar or shaft; "just beyond the tiller" is placed "vertically an apparatus "in the shape of a quadrant, to each end of which is attached "a block or sheave; the end of the tiller is formed like a fish "tail, and at the end of each tail is an eye to receive blocks "to correspond with those on the quadrant."

2. There is a lever as above "which works a shorter shaft or "spindle before the rudder head, the couplings of which are "fastened to the deck of the vessel," above this is "another "*but longer* shaft or spindle, and the two spindles are con-

"nected by a lever action, so that they both work in unison. "Near the after end of the upper spindle" is fixed "a bar "pointing downwards, at the end of which bar," are eye bolts to which blocks are attached. "On the rudder head is fixed "a yoke or tiller, and the same is worked by chains and "blocks reversed from the usual way."

In each case a pendulum is attached to the "upper part of "the main lever to assist in working the rudder." To show the position of the rudder at night there are "two swing lamps, "one near the upper end of the lever, and the other about "the centre, so that they will always shew which way the "lever is inclined, whether to port or starboard, and if the "helm is amidships the lights will be in a direct line one "above the other." There is also a "method of taking up "the slack chain or ropes, namely, by placing on the end of "the tiller two small levers to which are attached the chains "or blocks, which levers are connected by a small chain, the "use of which will be to draw round the slack chain."

[Printed, 8*d*. Drawings.]

A.D. 1859, February 17.—N° 449.

JOHNSON, JOHN HENRY.—(*A communication from John Eaton.*)—"Propelling and steering vessels."

The propelling apparatus consists of a "scroll shaped box" fitted horizontally at the stern or elsewhere. Within this box revolves a fan or series of blades on a vertical shaft driven by any prime mover. "A discharge mouth is made on one side "of the circumference of the box, and an inlet aperture is "made on the upper and under side of the same, both aper-"tures being covered over by a hood or box having a mouth "or opening in the contrary direction to the discharge mouth." The jet thus driven from the mouth of the casing serves to propel the vessel. For steering, the casing can be turned about by any suitable apparatus attached thereto, such as a pinion gearing with a circular rack fitted to the casing, worked by hand.

[Printed, 6*d*. Drawing.]

A.D. 1859, February 25.—N° 515.

REDDIE, JAMES.—(*Provisional protection only.*)—"Pro-"*pelling and steering* vessels."

The following is the whole Provisional Specification :—"This "invention relates to the propulsion of boats or vessels by means "of a vibrating flexible paddle or rudder, the chief object being "to avoid the use of oars and a fixed or rigid rudder, and to "enable boats to be propelled with less manual exertion than "is at present required for that purpose. In carrying out "this object I construct a flexible paddle of steel plates, or "steel, or whalebone, or other elastic ribs, covered with gutta "percha, or other suitable flexible material, so that it may "possess the yielding property of the fishes' tail when moved "to and fro in the water. This flexible paddle I set up edge-"wise at the stern of the vessel, and operate it by means of "a rigid helm, which being moved from right to left by "manual or other power will act as a propeller after the "manner of the tail of a fish. To retard or stop the progress "of the vessel the bows may be provided with hinged leaves "or fins, which may be let down in the water or opened out "so as to breast the stream ; or the flexible paddle or rudder "may be made hollow with sides inclining outwards from the "upper edge thereof, the depression of this rudder further "into the water may be made to retard or stop the progress "of the vessel. The flexible paddle or rudder may be applied "to both ends of a vessel to facilitate its propulsion in opposite "directions."

[Printed, 4*d*. No Drawings.]

A.D. 1859, March 9.—N° 615.

RUSSELL, JOHN SCOTT.—Ship-building.

Certain parts of the vessel's hull are formed of "yellow or "Muntz's metal." Among these are "the stern and rudder "posts" and the rudders.

[Printed, 4*d*. No Drawings.]

A.D. 1859, March 15.—N° 651.

GALLOWAY, GEORGE BELL.—Steam vessels, &c.

A vessel of peculiar construction is described. It has three kelsons "inside and out." "The use of the inside kelsons will "be for the affixing of boilers and engines thereto, and those "at the bottom of the vessel, the fore part may be formed "*like a wedge* form of entrance and at the after part may be

" affixed a helm or rudder having a communication with the " deck to assist in steering and reversing." The patentee also says, " I may in some cases use the principle of compressed " water or air for propelling and steering."

[Printed, 8*d*. Drawing.]

A.D. 1859, March 17.—N° 677.

SKELTON, THOMAS. — (*Provisional protection only.*) — " Steering apparatus.

The whole Provisional Specification is as follows :—" My " improvements relate, first, to tillers, and, secondly, to yokes ; " and their object in both cases is to avoid the slacking of the " steering ropes, and to improve the steering. In the case of " tillers, I form in the tiller a slot or a groove, in which runs a " roller fixed in the middle of a double block ; the steering ropes " are attached to this block and lead around a steering barrel " in the usual way, or in any other convenient manner. As " the steering wheel is turned, and the helm thereby moved, " the roller of the block slides along in the slot or groove in " the tiller, so as to prevent the necessity of the length of the " rope altering. In the case of yokes, I modify the plan by " fitting a rolling block at the end of each arm, the action " being essentially the same in both cases, the slot or groove " may, however, in the latter case be dispensed with, and " the roller allowed to run on the outside of the yoke arm. " I reserve to myself the right of modifying the foregoing " arrangements within certain limits, always, however, re- " taining the employment of a block which shall roll by " means of a roller or rollers along a tiller or yoke arm."

[Printed, 4*d*. No Drawings.]

A.D. 1859, April 11.—N° 904.

BOWER, ALFRED.—(*Provisional protection only.*)—Keels.

Improvements on No. 104, A.D. 1857.

" In the former invention these advantages were obtained " by making the ' keel,' or the ' keel ' and its appendages of " a truncated conical form when seen in vertical cross section " ' amidships.'

" Now, the present invention is intended to accomplish the " same or further advantages by means of moveable pieces

" attached to the bottom of the ordinary 'keel' by a hinged " joint, so that it may be set at any required angle by me- " chanical means, which can be acted upon from the interior " or 'deck' of the vessel; or sliding pieces may be attached " to each side of the 'keel,' which can be let down a given " distance below the 'keel,' or by wing pieces jointed to the " sides of the keel, which can be adjusted to any required " angle thereto by suitable mechanical means."

[Printed, 4*d*. No Drawings.]

A.D. 1859, April 23.—N° 1023.

GIBSON, WILLIAM.—"Steering apparatus."

The steering-wheel shaft has cut on it a screw, upon which nut moves. This nut is slotted, and in the slot a pin works on a horizontal lever, one end of which works on a fixed point, and the other end is connected to the end of the tiller. Both these connections are made by a slot working on a pin, to allow play to the lever. The fixed end of the lever may be attached to a standard rising from the deck, or to an arm fixed on a cross-bar supported by the same standards as the steering-wheel shaft.

[Printed, 10*d*. Drawing.]

A.D. 1859, April 25.—N° 1037.

HUMPHRYS, EDWARD.—"Steering apparatus."

The invention consists in a method of actuating the rudder by hydraulic pressure, the force being applied directly to the rudder without the intervention of chains, &c.

" A cylinder is used, in which a piston is worked or moved " to and fro by the pressure of water. The rod of this piston " is connected by a connecting rod or link to an arm on the " rudder-post. To the cylinder is applied a valve or slide " box, which is in communication with a water supply, which " is retained constantly at a suitable head or otherwise, so as " at all times to offer a suitable pressure in the valve box. " The slide or other suitable valve or valves is or are moved " by a lever or handle, so as to cause the rudder to be moved " towards starboard or port by the pressure of water on one " or other side of the piston, and when the rudder has been " moved to a desired position, it may be retained there by

"shutting off the water from the cylinder." "When the "apparatus is applied on board a steam ship or vessel, arrange- "ments may be made for continually pumping water, the "excess being allowed to escape by a safety valve or other- "wise."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1859, May 13.—N° 1199.

WHITEHOUSE, WILLIAM.—(*Provisional protection only.*) —"Steam vessels."

A "double-ended vessel propelled by two screws," one at each end, is described. The portion of the invention relating to the present series runs as follows:—"A steering wheel "raised on a platform above the deck, amidships, the same "operating by means of chains or ropes on both rudders at "once, by which the vessel can be turned in a smaller space "and much more expeditiously than on the ordinary plan. "—N.B. The novelty here is the using both rudders at once."

[Printed, 4*d.* No Drawings.]

A.D. 1859, May 23.—N° 1271.

CLARK, WILLIAM.—(*Provisional protection only.*)—"Pro- "pelling and manœuvring ships, vessels, and boats."

This "invention relates to the use of a manœuvring propeller" in vessels, "for the purpose of propelling them to one side or "the other, or of turning them round." "The propeller "consists of a thin blade of an irregular triangular shape, "forming when out of manœuvring use a portion of the stem, "bow, or cutwater of the ship. When the propeller is inert, "as when the ship is sailing straight forward, the wide end "of the propeller abuts against the under sides of the head "knees, and is held in that position by a bolt or pin, whilst "the narrow end is turned downwards, and tapers off to the "foot of the stem, at or near the keel. The propeller is "carried upon the forward end of a long horizontal shaft set "in bearings in the keel line of the ship, through the fore "foot of which it is passed by means of a stuffing-box. This "shaft may either be turned by the engine or by hand, or in "any other way. When set in motion, as the wide end of the "blade comes round it operates upon the water in such a "manner as to bear over the bow of the ship to one side or

" the other, as may be required. The propeller may also be " placed at the stern, or at any other convenient part of the " ship, its form being modified to suit the position in which " it is placed." "In vessels with upright stems the propeller " is made single, that is to say, it projects only on one side of " the shaft, and it is so contrived that when not required for " manœuvring it is turned down to abut against a projection " at the bottom of the stem, and thus virtually form a portion " of the stem," "or it may be drawn inboard."

[Printed, 4*d*. No Drawings.]

A.D. 1859, June 24.—N° 1516.

LISTER, WILLIAM, and GARRICK, THOMAS GILBERT.—"Im- " provements in ship's windlasses, and other like apparatuses, " applicable also to the steering of ships."

The part relating to the steering of ships is disclaimed in the Final Specification ; as relates to windlasses, the invention is thus described :—

"The windlass consists of two separate barrels (at each side) " working in opposite directions by means of friction rollers, " the main barrel having two grooves in it, and the other " having one ; the chain is taken over one groove in the main " barrel, underneath and round the grove in the other barrel, " then underneath and round the other grove in the main " barrel, and out at the hawse hole, thus giving two and a " half turns round the windlass with the chain, and preventing " all 'fleeting' and 'surging,' as the chain never moves out " of the grooves. The motion of the windlass in large vessels " is derived from a wheel with spiral cogs running loose on a " capstan spindle, and carried round in one direction by means " of pauls attached to the spindle, and taking into a wheel on " the centre of the windlass spindle ;" this is called the "pur- " chase wheel," "and the wheel of the capstan spindle the " driver." "The purchase wheel runs between two paul bits, " sufficiently apart to allow a disconnection at each side of the " wheel on a spindle of its own working in centres formed in " the ends of the windlass spindles ; each side of the windlass " runs in bearings on the paul bits. This arrangement allows " of one or both sides being connected or disconnected at " pleasure."

[Printed, 8d. Drawing.]

A.D. 1859, July 7.—N° 1616.

SMITH, JOHN.—"Propelling vessels."

Channels are formed in the bottom of the vessel leading from midships to the bows and stern. By means of a blowing engine, air is forced in "at the lower part of such open channels "against a stop or partition," and "force is exerted between "the water and the inclined upper surface of such channels." From the blowing apparatus the air is led by either of two tubes to the forward or aft channels, to propel the vessel ahead or astern. A valve is provided by which the air can be turned into either tube as required. Each of these tubes again forks into two tubes, one leading to each side of the vessel, and by means of throttle valves in these pipes the vessel is steered.

[Printed, 1s. 4d. Drawings.]

A.D. 1859, July 23.—N° 1725.

TENWICK, JOHN.—(*Provisional protection only.*)—"Steer-"ing apparatus."

The objects of the invention are to enable the rudder to be locked in any position, and also to allow a vertical movement to the rudder-post. Within a hollow casting secured to the deck of the vessel, there is arranged horizontally "a worm "wheel, the teeth of which are so formed as to gear into and "actuate right and left handed worms placed at opposite sides "or edges of said worm wheel, said worms being respectively "fixed upon revolving spindles, upon one end of each of "which a spur wheel is fixed, and gears into a larger spur "wheel upon the opposite end of the axis or shaft, whereof "the tiller is fixed. The axis of the before-mentioned worm "wheel is formed hollow, and such part receives the upper "part or head of the rudder-post, which should be so formed, "as also the part of the worm wheel through which it passes, "as to admit of the post moving vertically through the same, "the horizontal movement of the rudder being effected by the "axis of the worm wheel working in a circular hole or bearing "in the before-mentioned hollow casting. There is a pointer "on the head of the rudder post, and a divided index plate "beneath."

[Printed, 4d. No Drawings.]

A.D. 1859, August 3.—N° 1792.

FAY, TULLIUS PRIEST. — (*Provisional protection only.*)—"Apparatus for obtaining and applying motive power."

"The object of this invention is to obtain a multiplying "power, whereby one man may raise a weight of many tons. "The same power may also be applied to many purposes "where rapidity of motion is required, and is effected in the "following manner: — Upon a given shaft is cut a screw, "either right or left handed, or both, according to the motion "required to be obtained. A metallic disc or wheel is formed "with a semicircular groove around its periphery, in which "is cut a female screw, corresponding in pitch with that of "the male screwed shaft. This shaft is mounted on suitable "bearings and the metallic disc provided with a shaft in its "centre. Upon this last-mentioned shaft may be fixed a "large spur wheel, working into a pinion with a screwed "shaft attached, said screwed shaft working in another "female metallic disc mounted upon a shaft, upon which is "also another large spur wheel working into a pinion, upon "whose shaft is cut another screw, and so on until the "required power is gained (ad infinitum). The power thus "gained is as follows:—On motion being given to the first "shaft by means of a winch handle or other means, it trans-"mits a power of 150 times more (than that applied in the "first instance) to the disc, so it may be easy for any person "acquainted with mechanics to calculate the increase of "power from one shaft to another, so to obtain the power "required." This motion is said to be adapted to the working of ships' rudders and other matters.

[Printed, 4*d*. No Drawings.]

A.D. 1859, August 8.—N° 1829.

JOHNSON, JOHN HENRY.—(*A communication from François Augustin Harel and Michel Boniere.*)—(*Provisional protection only.*)—"Apparatus for steering ships."

"A horizontal worm wheel is firmly secured to the top of "the rudder-post or axis, and this wheel is actuated on dia-"metrically opposite sides by a pair of endless screws or "worms, the parallel spindles of which are geared together "*by a pair of* equally sized spur wheels. On one of these

" spindles is keyed the ordinary hand steering wheel. By " working this wheel, the screws will impart a partial rotatory " motion to the worm wheel and rudder, and will at the same " time always act as stops to control its motion. An indi- " cating pointer may be fixed on the top of the rudder-post, " which will shew at a glance the exact position of the " rudder as regards the vessel; in order to reduce the " friction as much as possible, spherical rollers or antifriction " balls may be placed beneath the worm wheel."

[Printed, 4*d*. No Drawings.]

A.D. 1859, September 14.—N° 2091.

GUMPEL, CHARLES GODFREY.—Propelling vessels.

One or more tubes or channels are fitted to the bottom of a vessel and along them water is driven by an engine of special construction to propel the vessel. A steering apparatus is described, which may be fitted at the mouths of the channels, so as to change the direction of the issuing jet and then steer the vessel. A hollow vertical shaft working through a stuffing box in the hull has fitted on its lower end a blade. Within this shaft is a second shaft with a similar blade. Both shafts have grooved pulleys fixed on their upper ends, the pulley on the internal shaft being smaller than that on the other. On motion being communicated to the pulleys by endless bands from a pulley on a steering wheel, the difference in their sizes causes them to rotate with different velocities and thereby set the blades on the ends of the shafts at an angle to one another. By varying this angle and the consequent direction of the issuing jet, the vessel is steered.

[Printed, 10*d*. Drawing.]

A.D. 1859, October 18.—N° 2379.

BOUSFIELD, GEORGE TOMLINSON. — (*A communication from Edward N. Dickerson*). — (*Provisional protection only*.)—" Machinery for steering vessels."

" There is fixed on the axis of a barrel which works the " tiller ropes a cog-wheel; into this cog-wheel a smaller " cog-wheel gears, having on its axis a crank which is coupled " with the piston rods of two steam cylinders. In a line with " the axis worked by the steam cylinders there is another

" axis having on it a crank, to which are connected the valve " rods for working the slide valves of the steam cylinders; " on this axis there is a cog-wheel into which a larger cog- " wheel gears, and on the axis of this larger wheel there is " a hand wheel, and by this hand wheel the valves of the " engines may be worked so as to cause the steam-engines " to rotate the barrel, working the tiller ropes in one or " other direction; on the end of the axis which works the " slide valves there is a projecting arm, and on the end of " the cranked axis worked by the steam engines there are " two projecting pins, and according as the engines are " caused to start in one or other direction by the slide valves, " one or other of the pins on the cranked axis worked by the " steam engines will come against the projecting arm and " rotate the axes to which it is attached, and by this means " work the slide valves so as to cause the engines to continue " to work in the same direction in which they were started " until the engines are stopped."

[Printed, 4*d*. No Drawings.]

A.D. 1859, October 20.—N° 2404.

HODGSON, JAMES.—Ship-building.

In the Provisional Specification a method is described by which the stern of a square or bluff ended vessel is fitted with a "triangular-formed chamber" of sheet iron, &c., to the end of which the rudder is hung. A similar chamber is affixed to the bows.

No part of the Final Specification alludes to this.

[Printed, 6*d*. Drawing.]

A.D. 1859, October 21.—N° 2410.

BOUSFIELD, GEORGE TOMLINSON.—(*A communication from E. N. Dickerson.*)—"Steering vessels."

The object is to steer the vessel by power. An ordinary steering-wheel has on its shaft a cog-wheel in gear with a pinion on a shaft on which is a crank for actuating the valves of two steam cylinders. In a line with this shaft is another shaft on which is a crank worked from the cylinders. A pinion on this shaft gears with a wheel on a shaft connected by a friction clutch with the shaft of a barrel on which the tiller chains are wound. By disconnecting the clutch the rudder

may be worked by hand. The engines are worked as follows :—On the end of the valve shaft is an arm, which as the shaft is turned strikes against one or other of two pins on the crank of the main shaft. When the shaft is turned, and the arm brought against either pin, the engine is started, and the crank consequently moved away from the pin. To continue the motion of the engine, the valve shaft must be still further turned, so as to keep the arm against the pin.

Any other motive power besides steam may be employed, and any other means for actuating the valves instead of a steering-wheel.

[Printed, 10*d*. Drawing.]

A.D. 1859, October 24.—N° 2431.

NEWTON, WILLIAM EDWARD. — (*A communication from Rollin Germain.*)—"Construction of ships or vessels."

A vessel is described of very great length in proportion to her breadth, and of a uniform taper from stem to stern, both ends being pointed. The taper is so great that "the extreme "after part of the vessel" forms the rudder, this portion being connected to the body of the vessel by a joint. "This "joint occupies the whole thickness and height of the stern "section where it occurs, and allows the rudder to turn "freely." "A sheathing is provided of spring steel or "other elastic material which covers the joint, but is not "fastened at the after edge, so that the rudder in turning will "slightly bend and raise the edge of such sheathing, and "still give the water a smooth passage over the joint." The rudder may be worked by any suitable apparatus.

[Printed, 1*s*. Drawing.]

A.D. 1859, November 7.—N° 2531.

CHARLTON, HENRY. — "Improvements in the method of "navigating steam ships or vessels, and in the apparatus "connected therewith."

The paddle-wheels are on separate shafts, and an intermediate shaft has a disc running on it and revolving with it, which carries a plate so placed that the pin of a paddle crank may take into a hole in the plate, and so gear the two wheels together. The motion of this disc to couple it with the pin and paddle shaft, or detach it, is regulated by the action of a

piston in a cylinder, to which steam can be admitted at one side or the other. The separate engines of the two paddle-wheels have separate throttle valves, and these are under the control of the helmsman, so that their relative speed may be regulated, and the paddles thereby caused to assist in steering the vessel. The steering is preferably effected from the bridge, and the handles operating the throttle valves are placed close to the steering-wheel.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1859, November 8.—N° 2537.

POWELL, HENRY BUCKWORTH.—Protecting screws, rudders, paddles, &c. from fouling.

A grating of wood or metal is hinged to the side of the ship, so that it can be brought into position to cover the propeller, rudder, &c. It "may be fixed on one or both sides of the "screw, paddles, rudder, and stern-post of the vessel." Ropes are attached to the grating, by which it can be brought into position. When not required, it lies flat against the side. It may also slide up and down in guides at the stern, or be hinged in such a way that it can be raised clear of the water.

[Printed, 8*d.* Drawing.]

A.D. 1859, November 29.—N° 2701.

COLWELL, CHARLES. — (*Provisional protection only.*)— "Propelling sea-going vessels without the use of either "paddle wheel or screw propeller."

The following is all the Provisional Specification :—"A sub-"merged double-actioned oscillating double-floated propeller, "which is capable of direct action without loss of power, with "increase of speed, at a less cost of fuel, and by which a ship "may be steered, or even turned in its own axis in case of "accident to the rudder, with the further advantage of apply-"ing this invention to either the stern or sides of the vessel."

[Printed, 4*d.* No Drawings.]

A.D. 1859, December 9.—N° 2795.

TENWICK, JOHN.—"Steering apparatus."

On the rudder-head is mounted a cog-wheel, the wheel being keyed on in such a way that by removing the key *it is disengaged* from its shaft, and the rudder may then be

worked in any other usual manner. An endless screw, sliding on a square shaft placed across the ship, takes into the cog-wheel. Helical or volute springs round this shaft abut against the spring, and rest with their other ends against nuts on the shaft; their use is to allow the screw to slide along the shaft when the rudder is struck by a sea heavy enough to overcome their resistance. At each end of this shaft there is a drum, from which endless chains are led to a drum on the steering-wheel shaft, which is placed at any convenient part of the ship.

A steering-wheel is also described, the box of which is of metal, the spokes and handles in wood of one piece, and the rim "hollow and open at one side to receive the handles." A ring fixed to the rim holds the latter in place.

[Printed, 10*d*. Drawing.]

A.D. 1859, December 13.—N° 2830.

BARLING, JOHN.—Propelling vessels.

Water is pumped by a force pump of special construction into a receiver, which may communicate with an air chamber. From the receiver pipes lead to openings in the bottom, one on each side of the keel. These openings are fitted with sliding tubes closed at bottom, and having one or more slots on one side. Suitable mechanism is provided for raising and lowering these tubes, and for turning them about so that the size of the opening can be varied, and the direction of the jet altered. To assist still further in manœuvring the vessel, similar discharge tubes are fitted one on each side of the keel at the bows, and the stream can be directed from the pump through these by means of stop-cocks.

[Printed, 8*d*. Drawing.]

1860.

A.D. 1860, January 18.—N° 135.

MAILLARD, NICHOLAS DORAN.—Steering, &c.

The first part of the invention consists of a combination of a compass and a clock face, so that the time of day and the points of the compass may be shown on the same face.

The second part relates to an apparatus to be connected to the rudder-head which may show the movements of the rudder on a dial. According to the drawing a horizontal spindle is driven by a mitre wheel on the rudder-stock. Another mitre wheel on this spindle drives two others with a vertical axis, one on a spindle surmounted by an index-hand, and the other on a hollow spindle surrounding the first, and carrying a compass card thereon. The effect of this is that each movement of the rudder drives the card in one direction, and the index in the reverse direction.

[Printed, 6*d*. Drawing.]

A.D. 1860, January 20.—N° 141.

GRIFFITH, WILLIAM. — (*Provisional protection only.*)—Propelling vessels, &c.

A cylinder is fitted in a suitable position in the ship, and has tubes leading to the stern through which, by the action of a piston and suitable valves, it impels a stream of water to propel the vessel by reaction against the external water. "The "escape of the water from the cylinder can be diverted by "suitable channels, so as either to back, turn round, or steer "the vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 26.—N° 203.

MAURER, JEAN JACQUES.—Propulsion of vessels.

This is effected by means of a continuous jet of water directed along tubes passing the whole length of the vessel. The jet is obtained by means of a pump of special construction and formed with several compartments, of which some are being filled with water while the others are expelling it. For steering purposes, lateral branch tubes are supplied to which the water is admitted through stop-cocks.

[Printed, 10*d*. Drawings.]

A.D. 1860, February 29.—N° 552.

LYNCH, PATRICK FRANCIS, and TYNAN, JOHN.—(*Provisional protection only.*)—"Construction of boats," &c.

The only part of the invention which concerns the present *invention relates to* a "self-steering apparatus to be affixed

" to a model boat intended to be sent adrift from a vessel in " distress." This apparatus "consists of a rod having affixed " at the top an umbrella-shaped apparatus, on which the wind " acts; the other end of the rod fits into or on an octagon- " shaped rudder head. This apparatus set with the position " of the sail will allow the model boat or messenger to be " directed as desired."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 3.—N° 594.

SCHIELE, CHRISTIAN. — "Obtaining and applying motive " power from ocean or other waves."

The object of the invention is to apply means for "taking " up the power exerted by the waves." "Oblique surfaces " or boards, buoys, floats, pistons working in cylinders, and " boards on hinges" are exposed to the action of the waves in such a way that "the waves motion shall impart a horizontal " reciprocating motion, a direct horizontal, a vertical, a " rotatory, a surgin, or other motion." Power thus accumulated is stored up by means of a pump or otherwise and employed for various purposes, amongst others "steering" in some way not further explained.

"The oblique surfaces or boards" may be employed for towing ships. To a hollow floating beam are hinged a number of "oblique surfaces like wings" which are moved up and down by the waves and propel the beam. Towing cables are led from the beam to the ship. By using two cables the beam may be steered. Or "two balanced rudders" may be connected to the beam and actuated from the ship's deck. Similar " wings" attached to rudders are stated to increase their steering power.

[Printed, 10*d*. Drawing.]

A.D. 1860, March 24.—N° 771.

ABBOTT, EDWARD.—(*Provisional protection only.*)—"Steer- " ing ships."

The following is the whole Provisional Specification:—"This " invention has for its object an improvement in steering ships " and other vessels; for this purpose the rudder is hung and " caused to move on a horizontal or nearly horizontal axis in

" place of the pintles or axes heretofore used. It is desirable " that the blade of the rudder should not be wider than the " rudder post. The steering of a ship or vessel is effected " by inclining the lower part of the rudder beyond the " rudder post, more or less, according to the extent the " rudder is for the time desired to act."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 29.—N° 817.

HAMILTON, JOHN, junior.—Ship-building.

A vessel with a double stern and a stern paddle wheel is described. "The rudder is placed beyond the paddle wheel, " and its axis is supported in a suitable bearing or bearings " on deck, no stern post being used."

No other part of the description refers to the present series.

[Printed, 8*d*. Drawing.]

A.D. 1860, May 3.—N° 1114.

HENRY, MICHAEL. — (*A communication from Louis Coignard.*)—" Propelling, turning, and changing the direction " of ships, balloons, and other bodies."

Water is driven along tubes discharging into the water in which the vessel floats so as to propel the vessel by its reaction. For steering purposes the tubes may terminate in curved tubes fitted in sockets so as to turn freely in any direction. This turning may be effected by mounting a collar on the curved tube which is revolved by means of a pinion suitably actuated. As shown in the drawing, the discharge pipes pass vertically downwards at the stern so that the plane in which the curved ends move is a horizontal one.

[Printed, 8*d*. Drawing.]

A.D. 1860, May 25.—N° 1297.

FINCH, BENJAMIN.—(*Provisional protection only.*)—" Ar- " rangement of the rudders of ships."

The entire Provisional Specification is as follows:—"This " invention has for its object an improvement in the arrange- " ment of the rudders of ships and vessels; heretofore steam " vessels built to run either end foremost have frequently been " fitted with two rudders, one or other of which is employed " according as one or other end of the vessel is leading, the

"other rudder being for the time locked. Now, according to "this invention I fit ships and vessels with two rudders, one "at each end, and I connect the two together in such a manner "that they necessarily move both at the same time and towards "the same side of the ship or vessel. By this arrangement the "two rudders both tend to turn the ship in the same direction, "and the pressure of the water on the one is balanced by that "on the other, and consequently but little power is required "to steer the ship or vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1860, June 21.—N° 1502.

TELFER, JOHN.—(*Provisional protection only.*)—"Im- "provements in capstans and winches for hoisting, which "improvements are also applicable to the steering of ships."

The barrel is placed "in a horizontal position instead of "vertically as heretofore," and attached to "a revolving pillar "so as to swing it round to any required angle. At the end "of the barrel or cylinder nearest the pillar is an inner "toothed wheel, into which takes a spur wheel for quick or "ordinary motion, but where much power is required a pinion "is placed near the spur wheel, which can be thrown into or "out of gear as required, both wheels being actuated by a "loose winch handle. When required to alter the position of "the cylinder it can be swung round with the pillar on a "turntable, said table having slots cut at intervals, into which "falls a tongue to keep it in the position required. When "required for steering purposes the pillar and cylinder are to "be detached from the table and bolted to the ship's deck, the "tiller ropes or chains made fast on to the barrel, and the "apparatus is then ready for use."

[Printed, 4*d*. No Drawings.]

A.D. 1860, July 10.—N° 1656.

JORDESON, THOMAS POWDITCH.—Life-boats.

A "tubular" life-boat, covered in above, is described. It has "moveable T shaped keels, which are inserted through "spaces formed to receive them." These keels consist of a "vertical plate or plates with two wings at the lower end, and "they may, if preferred, be constructed so that the wings

" may have a tendency to open or spread apart by the upward " pressure of the water. Four of such keels are intended to " be applied to each boat or vessel, viz., one at each end and " one at each side, but the number may be varied. These " keels are also capable of being raised so as to bring the " wings in contact with the bottom of the vessel when " required."

[Printed, 6*d*. Drawing.]

A.D. 1860, October 5.—N° 2413.

RICHARDSON, THEODORE MANSFIELD. — "Steering appa- " ratus."

An endless rope or chain is carried round a barrel on the steering-wheel shaft and round a barrel on a parallel shaft below it and on a level with the tiller and beside it. A similar barrel on the other side of the tiller is driven in the same way, by a second endless chain, or one chain from the main drum may drive both. A chain passes round both these drums and is attached at its ends to a slider which works in a slot in the tiller, or on the tiller.

The intention is to prevent the coils of the chains as generally "over-riding."

[Printed, 6*d*. Drawing.]

A.D. 1860, October 15.—N° 2509.

SINGER, ISAAC MERRITT.—" Improvements in the construc- " tion and fitting of steam vessels.

Three hulls are fixed side by side, connected by suitable bracings. With regard to the present series, the inventor says :—" As the ordinary mode of steering vessels by a rudder " at the stern may not suffice for this novel construction of " compound vessel, more especially when moving in narrow " waters, I provide at the opposite ends of the central hull a " pair of engines" for driving respectively a propeller shaft mounted in a line with the keel of the hull. These shafts I fit " each with a paddle wheel or other propeller, the same being " intended to steer the vessel either singly or simultaneously, " as desired. When the vessel is at sea, it will be desirable to " raise one and occasionally both of these steering paddle " *wheels out of* the water. This is effected by making a joint

" on the shafts of these wheels and raising the wheel by means " of a chain and windlass worked from the paddle wheel " shaft."

[Printed, 10*d*. Drawing.]

A.D. 1860, October 16.—N° 2518.

ROBERTS, RICHARD, and SYMONDS, THOMAS EDWARD.—(*Provisional protection only.*)—" Marine steam engines."

Several improvements in these are described. Amongst others the inventors say :—" We prefer in ships of war and " other vessels, to employ two screw propellers, one under " either quarter, and to drive such screws by means of hori- " zontal engines working separately, or they may be geared " and work together, but capable of being worked separately, " and when necessary in opposite directions, for the purpose " of more readily manœuvring the vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1860, October 22.—N° 2576.

HART, GEORGE WILLIAM.—" Construction of vessels."

Among the improvements described are some connected with the rudder and steering apparatus. To prevent injury to the rudder from shot, its upper part is " carried through a shaft at " the stern," and it may be hung " within the dead-wood." Two rudders may be used, one on each side of the dead-wood so that they lie flush with it when not in use, and to steer the vessel the one only on the side required is caused to turn outwards while the other remains steady. Each rudder is hung to " an iron rudder post in the shape of a band passing down " one side under the keel and up the other." To operate the rudders, they have tillers set at an angle outward from each rudder-head. A slotted plate fits over pins arranged to slide in grooves in each tiller. The tiller ropes are attached to the ends of this plate. The effect of this is, that when the plate is carried over to one side or the other by the ropes, it carries with it the tiller of the rudder on the opposite side to that towards which it is moved, but slides over the pin in the other tiller without affecting it.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, November 6.—N° 2718.

RAMMELL, THOMAS WEBSTER.—"Centrifugal discs."

The inventor describes a "centrifugal disc" which may be used, among other purposes, to produce a jet of water for the propulsion of vessels. The disc works in a central chamber from which tubes lead to the bows and stern. In the arrangement figured in the drawings, there is a single tube leading aft, forked near the stern, and discharging by two openings, one on each side; there are two tubes leading to the bows, one on each side, and two leading to openings about midships. These last two are curved, so as to discharge backwards. By valves in these tubes the jets can be controlled so as to guide the vessel.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1860, December 12.—N° 3054.

KYLE, ALEXANDER.—"Propelling ships or vessels."

The propeller consists of a vertical shaft suitably mounted at the stern, to which are affixed horizontal radial arms in pairs, and each pair of these arms carries between them a vertical blade on a shaft capable of revolution. These shafts are connected to a ring above by a series of cranks. On the shaft of one of the propelling blades is a spur-wheel connected to the ring by an eccentric pin, instead of a crank. This spur-wheel gears with another carried by the radial arm of the blade, and this again with a pinion having half the number of cogs fitted loosely on the propeller shaft. This pinion can be moved through suitable gearing by a steering-wheel, and the object of the apparatus is to set the blades so that they feather at any part of the stroke and serve to steer the vessel.

Similar propellers may be fixed at both sides of a vessel, and may be used for steering by being worked by separate engines so that they may act when required in opposite directions.

[Printed, 6*d.* Drawing.]

A.D. 1860, December 17.—N° 3102.

MOREL, ERNEST LEON.—(*Provisional protection only.*)—Temporary rudders.

The temporary rudder is "constructed in sections, and may "be composed either of wood or sheet iron, and is provided "with eye bolts, through which may be passed a strong iron "rod, bar, or shaft, on which the temporary rudder works or "turns as an axle." The sections are constructed "in such a "manner with iron clamps or otherwise that any desired "number of them may be connected together by means of "screw bolts or screws. In order to facilitate the mounting "of the temporary rudder, a horizontal hole is made through "the stern post at some convenient point below the water line, "and through the hole is passed a chain or rope, both ends "of which are secured on deck." It is "lowered into the "water by means of a chain secured to the upper part of the "rudder spindle or axle, the lower end of which is secured to "one of the ends of the rope or chain that is passed through "the hole in the stern post. By hauling on the other end of "the rope or chain the lower part of the rudder spindle will "be brought against the horizontal hole in the stern post, and "by securing the rope on deck the rudder may be held fast "at its lower end. The upper end of the spindle is let into "and works in an eye or socket fixed in the stern post for the "purpose, so that the rudder spindle will have two fixed "points to turn upon. In order to work the rudder two ropes "are secured to it, one on each side, and near to the outer "edge, and these ropes being passed through pullies secured "at the ends of a cross-tree or spar projecting over both sides "of the vessel, and the ends of the ropes being brought on "to the deck, the rudder may be manœuvred."

[Printed, 4*d*. No Drawings].

A.D. 1860, December 27.—N° 3174.

MULLEY, William Robinson.—Steering ships.

"Auxiliary rudders or wings" are fitted to act as substitutes for or auxiliaries to the main rudder. These are fixed at any suitable point in the vessel's side below the water-line. They are formed of iron bars or plates pivotted on a bar attached to the vessels side, and a recess may be adapted into which they may fit, so as to lie flush with the side when not in use. They are actuated by a rod which passes through a stuffing box, and is actuated by any suitable steering apparatus. They are to be constructed so that "the several parts will twist or move

" independently of the head piece or bolt upon and by which " they hang and turn, so that the whole will readily adapt " itself to the shape of the ship's bottom." To this end one side may be fixed, and the other extended by a spring. An indicator to show the position of each rudder may be attached to it.

[Printed, 8*d*. Drawing.]

1861.

A.D. 1861, January 16.—N° 128.

TELFER, JOHN.—(*Provisional protection only.*)—" Improve- " ments in capstans and winches for hoisting, which improve- " ments are also applicable to the steering of ships."

The inventor proposes " employing a barrel or cylinder, and " placing it in a horizontal position " " and attaching it to a " revolving pillar, so as to swing it round to any required " angle ;" also " placing a toothed wheel having teeth inside " it at that end of the barrel " " nearest to the pillar, into " which wheel gears a smaller spur wheel for quick motion ; " but where much power is required, a toothed pinion may be " placed near the spur wheel, and made to work in or out of " gear as more or less power is required, both wheels being " actuated by a loose winch handle." The apparatus may be fixed on a turn-table, held in position by a hinged lug falling into one of a series of slots.

For steering, " the pillar and cylinder are to be detached " from the table and secured to the ship's deck, the tiller ropes " or chains being made fast on to the barrel or cylinder."

[Printed, 4*d*. No Drawings.]

A.D. 1861, January 30.—N° 247.

POOLE, JOHN, and WRIGHT, JAMES.—Steering vessels.

The first part of the invention relates to a method of steering ships by means of rotating vanes in a cylinder open to the water. This cylinder is to be placed, according to different parts of the Specification, " transversely to the direction of the " *ship's length* " at any part of the ship (the Provisional

Specification says, "preferably the stem," and the Final "pre-" ferably the stern"), or "in the longitudinal axis of the ship."

The second part relates to a method of steering by power. A barrel mounted on a shaft above the rudder-head is driven by an endless chain from the propeller shaft or other part of the propelling engine. On this shaft is formed a double cone, and on each side of this a cylinder with a conical interior surface fits. By means of a lever either cylinder can be jammed against the conical part of the shaft so as to rotate with it. The cylinders are grooved or fitted with cogs, and on each a rope or chain from one side of the tiller is wound. The steering-wheel and gear of the ordinary description is added so that it may be used when required.

In the third part of the invention the barrel on the ordinary steering-wheel shaft is made conical, with its largest diameter in the middle, while the corresponding barrel on a shaft below, whence motion is conveyed to the tiller, is "of a reverse out-" line" and has its smallest diameter in the centre (so that the section of the one is double-convex, of the other double-concave.) The result of this is that ratio of motion of the two shafts constantly varies, and the greatest power may be applied to the rudder when it is most required, that is, when it is hard over.

[Printed, 10*d*. Drawing.]

A.D. 1861, February 27.—N° 509.

WEALLENS, WILLIAM.—Steam engines, marine propulsion, &c.

Among other improvements is one for using two propellers at the stern for steering as well as propulsion.

The propeller shafts are driven from two engine-shafts placed in the same line. At the outer end of each of these shafts is a bevel wheel gearing with a wheel on its propeller shaft. On the inner end of each of them is a bevel wheel which gears into one of two concentric bevel wheels, of which one revolves on the boss of the other. The outer of these two wheels has a spur wheel with internal teeth keyed on its lower face, the inner one has a pinion in a similar position, and both these gear with a pinion mounted on the end of an arm keyed on a shaft passing through the axle of the central pinion. The

sizes of the wheels are so regulated that when the propeller shafts are revolving at the same rate, the internal spur wheel and the central pinion also revolve at the same rate, but in opposite directions, and therefore the pinion gearing with both revolves without altering its position. When, however, one shaft is rotating faster than the other, this pinion is carried in one or other direction, and moves the arm by which it is carried; this rotates its shaft and the shaft operates the throttle valves to check the rate of one engine and increase that of the other. The object of this arrangement is to keep the two propellers working at a uniform rate when they are not in use for steering. When the propellers are required for steering, they are disconnected from each other. The apparatus is principally applicable to screw propellers, but may be applied to paddle-wheels.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1861, March 20.—N° 698.

SYMONS, ALEXANDER.—(*Provisional protection only.*)—"Improvements in apparatus for propelling and steering "vessels."

A screw propeller working in a water-tight casing is caused to draw in and expel water through tubes connected therewith, and leading to "apertures in the bows and also at the stern "of the vessel, and likewise at each side of the vessel." These apertures are fitted with valves and by opening or closing these the vessel may be steered. The motor may be a steam engine or any other motive-power engine.

[Printed, 4*d.* No Drawings.]

A.D. 1861, March 27.—N° 762.

JEFFS, WILLIAM, and PENNOCK, JOSEPH. — Steering vessels.

The invention refers to steering vessels by hydraulic power. A slider on the tiller has on it a pin fitting loosely in a boss on a cylinder fitted transversely across the ship. This cylinder is free to slide in guides. In it is fitted a piston with a rod at each side. The ends of the rods are fixed, so that the piston is motionless while the cylinder can move. The rods are *hollow, and* are connected by pipes to a force-pump, by which

water can be driven into the cylinder. Suitable arrangements are made by admitting the water on either side of the piston as required.

The force pump may be worked by the propelling engine or otherwise.

[Printed, 10*d*. Drawing.]

A.D. 1861, March 30.—N° 782.

SIMONS, WILLIAM.—(*Provisional protection only.*)—Ship-building.

Among various improvements enumerated, the following concerns this series:—"Rivetting the bands of iron rudders "upon the rudders themselves, instead of upon the stern "posts, the axis being in the stern post, which is formed with "apertures to receive the bands instead of in the rudder stock. "This arrangement permits of the end plates being caulked "in a more satisfactory manner than hitherto."

[Printed, 4*d*. No Drawings.]

A.D. 1861, May 11.—N° 1201.

JONES, GEORGE FOWLER, and JONES, JAMES.—(*Provisional protection only.*)—"Propelling and steering steam vessels."

Propellers of various descriptions are to be used in a casing or recess in the vessel, which may serve as a condenser for the steam engine, or may have air forced into it "to give increased "freedom of action to the propeller."

A propeller "in the disc form" may be mounted on a vertical shaft "in an external position" and "accompanied "by a shield having a motion around the same, and being "furnished with plates or flanges projecting interiorily between "the discs." Steering is effected by the moving of this shield "about its vertical axis to any required angle in relation to "the ship's course; and for this purpose a position at the "bows, at the sides, or at the stern will apply."

[Printed, 4*d*. No Drawings.]

A.D. 1861, May 11.—N° 1205.

CLARK, WILLIAM.—(*A communication from John Theodore Scholl.*)—Life-boats.

The life-boat described is fitted within an exterior frame which is free to revolve. The only part relating to the present series concerns the rudder. This consists of a heavy metal plate fitted obliquely on a rod which passes into the interior part of the boat at the bows. This rod is fitted "at one end " of and parallel to the axis of the boat." As the outer frame revolves, the weight of the rudder prevents its being carried round. It is operated by a crank or handle within the boat. To lessen shocks, the rudder is fitted to bear against a spring.

[Printed, 1*s*. Drawing.]

A.D. 1861, June 3.—N° 1389.

TOWL, JOHN.—Propelling vessels.

The vessel is propelled by two jets of water produced by a centrifugal wheel working in a case. Below the bottom of the hull, on each side of the hull, is fitted a chamber with openings delivering fore and aft, which is divided centrally by a partition. Either part of this chamber can be put into communication with the centre or the circumference of the wheel, so as to force water either in or out thereof. There are two sliding valves to each chamber, and these four valves are all worked by a chain from a steering-wheel on deck, so as to guide the course of the vessel, by altering the direction of the jets on either or both sides.

[Printed, 10*d*. Drawing.]

A.D. 1861, June 4.—N° 1401.

FORD, JOHN.—(*Provisional protection only.*)—"Ships' " rudders."

The following is the entire Provisional Specification :—"My " invention consists, firstly, in fitting the bottom of rudders " with a spindle, and in so pivotting them upon a frame or " shoe projecting backward beyond the rudder post, that about " one-third, more or less, of the rudder may, when fixed, be " in front of a vertical line drawn in a line with the spindle. " My invention consists, secondly, in affording protection " for the heads of rudders generally, by passing them through " an aperture made in a forging or forgings, which extend " from the water line, or below it to the deck of the ship."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 6.—N° 1425.

STRATFORD, CHARLES.—(*Provisional protection only.*)—"An equilibrium steering apparatus."

"It consists of a fan or blade being placed at the stern, "bows, or stern and bows of vessels, such fan or blade being "worked by a vertical spindle; the spindle being placed in "the centre of the fan or blade, so that upon the fan or blade "assuming any angle with the line of keel, two columns "of water from the two respective sides of the vessel will im- "pinge upon the fan or blade with equal force upon each "side of the spindle or centre of motion, the entire force "being removed upon the inclined surface of the fan or blade, "and thrown off in a lateral direction on one or other side of "the vessel, the reacting force causing the vessel to turn "either way as required."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 18.—N° 1557.

WALKER, ROBERT.—Propelling vessels.

The vessel is propelled by "a blade" which is arranged horizontally, and "is fixed by its front end at right angles to a "vertical rod arranged at the stern," side, or other part of the vessel, and "made to reciprocate vertically." "The blade is "constructed so as to possess an elastic flexibility, and when "it is moved downwards its outer back end is bent upwards, "its surface being inclined in such a way as with the down- "ward motion to propel the vessel forward. When the blade "is moved upwards it becomes bent in the opposite direction, "so as to be inclined downwards towards its outer back end, "and so that it still propels the vessel forwards." The rod or rods are worked by a crank on an engine-shaft. "Provision "may be made for adjusting the propelling details so as to "propel backwards or sideways." "It is preferred to provide "the rods with loose bushes or sleeves held between collars, "reciprocating motion being imparted to and through such "bushes; and means being provided for setting the rods "round to cause the propelling action to take effect in a back- "ward or other direction, whereby great control over the "movements of the vessel will be obtained."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 24.—N° 1614.

MOORE, ROBERT.—(*Letters Patent void for want of Final Specification.*)—"Construction, steering, and propelling of "ships."

The portion of the Specification referring to the present series is contained in the following extract:—"The second part "of the invention, relating to the means of steering, applied "either as auxiliary to or in substitution and independent of "a rudder, consist of the employment of two or more helical "vanes placed in the forward or aftercant body of the ship or "other vessel, or in both. The plane of rotation of such "vanes should be parallel or oblique to or upon the line of "midship section of the vessel, and entirely independent of "the action of the propeller, so far as propulsion is con-"cerned. These vanes act laterally or sideways on the water "at both sides of the ship, in a frame or transverse passage or "opening (made water-tight when necessary to prevent leak-"age in the ship), and driven by any mechanical contrivance "or motive power available for such purpose. I do not claim "as any portion of this arrangement the application of any "contrivance for steering the ship by the propeller, nor by a "single steering or auxiliary screw, both of which have been "unsuccessfully attempted, and generally discarded, but the "practical character of my invention is the adaptation of two "or more vanes or series or combinations of vanes so adjusted "as to steer with equal effect to port or starboard, or if neces-"sary unequally to compensate for the unequal action of "screw-propellers in the direct movement of the ship where "such defect arises."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 19.—N° 1823.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from Eugene Coulon.*)—Propelling vessels.

"This invention consists in propelling ships and other "vessels by the discharge of dry or superheated steam directly "against the water." The steam is "conveyed through pipes "provided with cocks and with adjustable nozzles, so that by "turning the nozzles, and by allowing the steam to issue from "the pipes at any particular part of the vessel at or below

" the water line, the vessel may be propelled in any required " direction."

[Printed, 6*d*. Drawing.]

A.D. 1861, August 8.—N° 1975.

BOVILL, GEORGE HINTON.—Ship-building.

Among the other improvements described is one according to which a vessel may be steered by a jet of water directed from openings in the sides. Across the vessel at right angles to the keel in a suitable position is a passage, in the middle of which is a centrifugal pump. Across the passage, on either side of the pump, is a valve so arranged as to place the passage in communication either with the centre or the circumference of the pump. By this means the water is either drawn in or driven out through either end of the passage, and the ship steered accordingly. Various means of effecting this may, it is said, be used. According to the method figured, a chamber is formed in the tube, and this is divided by a horizontal partition into two compartments, within the lower one of which the pump works. At the centre of the wheel is an opening in the partition, through which the water can pass to the centre of the pump. At each end of the partition is a valve, formed of two plates at right angles (thus L) pivotted at the angle. By turning this through an arc of 45° communication can be established with either the upper or lower compartment, and therefore with either the centre or the circumference of the pump. The valve at the other end of the partition is at the same time placed in the reverse position.

[Printed, 1*s*. Drawing.]

A.D. 1861, August 26.—N° 2119.

MENNONS, MARC ANTOINE FRANÇOIS.—(*A communication from Pierre Louis Timothée Thier.*)—" Propulsion and " steerage of ships or vessels."

A " canal " is formed through the ship from stem to stern. In it works a propelling apparatus, such as a paddle-wheel, screw, force-pump, turbine, &c. The canal is formed with two openings at the bows and one at the stern. The rudder-shaft passes in the usual position vertically across the opening,

and the rudder has a second blade in front, which works in the opening and serves to partly close the opening on one side and thus direct the issuing stream to one side or the other. The rudder is thus of the description known as equipollent. The canal may also divide near the stern, and lead to two openings one on each side of the hull, and these may each be fitted with a rudder which may serve to close either outlet as required. Or a valve may be fitted at the point where the canal divides, so that the stream may be cut off from either of the stern passages.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1861, September 9.—N° 2249.

FRYER, ALFRED.—Propelling vessels.

The propeller consists of a frame in which are fitted hinged vanes which open when drawn forward and close to act against the water. These are fitted to any suitable part of the vessel and are operated directly from the piston rods of a corresponding number of steam cylinders. By the use of a rocking lever two of these propellers may be worked simultaneously, so that one is drawn forward while the other is forced backward. For steering purposes two may be placed at the stern, one on each side, or two may be caused to act at right angles to the keel at any suitable part of the vessel. The steering is effected by reversing the direction in which the vanes feather. This may be done by having frames which can be forced against one or other side of the vanes, so as to act as a stop. These frames may be moved by chains carried over a drum attached to the connecting rod of the propeller. Several other methods of reversing the action of the vanes are described. The floats may be connected together, and their position governed by moving the top float. Or three frames may be used; the floats are attached to the centre one which can be carried backwards or forwards, so that the floats rest against one or other of the other two frames, which then acts as a stop for the floats. Or the floats "are made to "overlap each other a little at the bottom" and they "can "be raised a little, and pushed backwards or forwards as "desired, and then let down immediately."

[Printed, 1*s.* Drawings.]

A.D. 1861, September 16.—N° 2304.

MERITON, THOMAS.—Steering apparatus.

This invention consists of a method of applying a friction brake to steering apparatus. A wheel on the steering-wheel shaft has around it a strap fitted with stops of wood or other material to produce friction. One end of this strap is fixed, and the other is fastened to the ends of two levers, one on each side of the steering-wheel, by which the strap may be tightened and the wheel with the rudder held fast in any required position.

[Printed, 8*d*. Drawing.]

A.D. 1861, September 19.—N° 2343.

SILVER, THOMAS, and MOORE, THOMAS. — (*Provisional protection only.*)—"Construction of and appliances to steam "ships or other vessels."

Various improvements in ship-building are described, of which two are connected with the present series. The inventors say:—"The sixth part of our invention consists in "steering apparatus. This may be effected in the ordinary "manner, or by steam power in combination with an hydraulic "cylinder and piston, the latter being for the purpose of "maintaining the position in which the rudder may be "placed by the power of the steam pistons. The steam "pistons may work in fixed, vibrating, or rotary cylinders, "and the whole placed in the most convenient part of a ship "to suit requirements, and connected by chains or other "suitable contrivances."

"The eleventh part of our invention consists in steering "floats worked on either side of the stern or quarter by a "cogged connecting shaft from side to side of the ship, "actuated by a vertical spindle driving a spur wheel or "endless screw or by a wormed screw."

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 30.—N° 2720.

LEIGH, EVAN.—Shipbuilding, &c.

Part of the improvements relates to "working ships' helms "by a worm and sector wheel," "and also in connecting "the two helms, fore and aft, [these do not appear to be

" otherwise described] by strong wire ropes or tension rods" which "cross each other, so that when one helm is moved " the other moves also." Reference is also made to No. 12,708, A.D. 1849, and an improvement thereon described. In this there are "two screws one on each side of the ship." These are worked independently, and by this means the vessel is steered. In the present improvement "the steering rod " coming on deck should be made to act on the expansion " valves of the engines, instead of on the throttle valves;" and "two separate vertical rods should come through the " upper deck arranged to control or shut off the steam of " either engine or pair of engines."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1861, November 26.—N° 2966.

BRAXTON, CHARLES GEORGE. — (*Provisional protection only.*)—"Propelling and steering vessels."

The whole Provisional Specification runs as follows :—"I run " a shaft from the engine-room under the beams and through " the stern-post, also one from the engine-room forward through " the stern about two feet under water, and working in con- " trary directions. On the outer ends of the shaft I fix a " paddle with two blades, in form like the blade of an oar, in " such manner that it may be taken off and on very easily by " the crew, as I do not intend the one at the stem shall be " used except in light winds and in a calm, or when the stern " one is used for other purposes; in such cases I intend it to " steer the ship alone, the engineer to work it and steer the " ship in the engine-room receiving orders from the officer of " the watch by means of a tube from the deck. In case the " ship is short of coals and in a calm, I unship the stern " paddle and put on a screw to propel the ship, and steer by " the bow paddle alone, and for the purpose of driving this " screw I attach several winches to the upright under each " beam, driving the shaft both above and below, so that any " number of men may heave by several handles to take off " and on at any part of the ship; this I intend principally for " sailing ships and transports. Boats also may be propelled " by the same means, the handle working between each " thwart."

[Printed, 4d. No Drawings.]

A.D. 1861, December 9.—N° 3088.

NEWTON, Sussex.—(*Provisional protection only.*)—"Appa-
" ratus for steering & stopping vessels."

The improvements consist in "the application of plates or " surfaces inlaid in the sides of ships below the water line, " such plates presenting a flush surface with the side of the " ship when in the recesses made for their reception. They " are made by preference of considerable length, and some- " what wider at one end than the other. At the base or " wider end they are hinged to the ship's side; from this " point they are laid forward in the recesses for their recep- " tion, and have chains attached at the free ends, which are " rove through eyes or other gear, and laid on deck or other- " wise, whereby the surfaces can be extended at right angles, " or at any other angle to the ship's side, or hauled close into " their respective recesses. One chain extends from the free " end of the surfaces aft, while the other is led forward, and " is by them rigidly secured in any position desired."

There are two, four, six, or more of these surfaces arranged in pairs, one on either side of the vessel.

[Printed, 4*d*. No Drawings.]

1862.

A.D. 1862, January 1.—N° 5.

WALKER, John.—Forts, floating batteries, &c.

A turret-ship is described. With regard to the present series the inventor says:—"When the vessel and fort are required " to operate at sea, I fit the vessel with one or two powerful " force pumps, by which water can be forced out at either " side at the bows, and thus the head of the vessel be turned " about as required." Thus "the head of the fort vessel can " be turned independently of the rudder."

[Printed, 10*d*. Drawing.]

A.D. 1862, February 6.—N° 316.

HENRY, MICHAEL.—(*A communication from Louis Coignard.*)—"Obtaining and applying motive power."

The greater part of the Specification is occupied with a dsscription of what is termed an "aqua motor" or apparatus by which it is stated that power is produced which may be applied to drive a turbine, and by this turbine a stream of water is to be produced which may be used for the propulsion of vessels. This stream may be directed through four tubes or two forked tubes leading through the hull in different directions and "the vessel's direction of motion may be altered by "handles in gear with twin valves, whereof one opens a "passage, while the other closes another; the handle may "also work doors which slide in guide ways, and close on the "outer side the recesses for the exit of the propeller stream." The motion of the valves is repeated on a dial near the steersman. The vessel may also be steered by causing the various tubes to lead from a cylindrical casing within which is a second cylinder fitted with suitable apertures and capable of revolution within the first, so that the stream of water being received within the inner cylinder, it can be admitted to such of the propelling tubes as may be required.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1862, February 7.—N° 330.

BARTHOLOMEW, WILLIAM HAMOND.—Barges, &c.

A method of connecting barges into a train is described. A projection on the bows of each barge fits into a corresponding recess in the stern of the barge before it. The steering of the train is effected by means of two chains attached to the front barge, and led along the sides of the barges, one chain on each side, to the last barge, where a windlass is fitted having two barrels worked in opposite directions by gearing from a steering wheel. By this means one chain may be slacked off, and the other tightened, so as to cause the train to assume a curved form. The windlass may, if preferred, be placed in any other barge instead of the last. As shown in the drawing, the train is propelled by a tug at the stern, and this is steered in the usual way by a rudder.

[Printed, 1s. Drawing.]

A.D. 1862, February 28.—N° 552.

PARKER, JAMES.—Propelling vessels.

The first part of the invention relates to improvements on No. 2374, A.D. 1860, in which a method was described of propelling vessels by discharging high-pressure steam through a tube into the water at the stern.

The improvements consist in altering the shape of the tubes and orifices through which the jet issues, and arranging openings through which air may be admitted to mix with the steam, and be driven out therewith. Guides or channels are fitted along the sides of the hull to direct the course of the stream of air and steam.

The second part consists in applying the above method to the steering of ships, &c., the same being propelled in any desired manner. For this purpose there are "air troughs or "guides on the right and left sides of the stern or bow of "such ship" at any suitable inclination. The inventor would also steer vessels "by the propulsive force of air forced out "through apertures provided for this purpose in suitable "parts of such vessel." "The propulsive force of the air, "and the force of the air rising by its buoyancy may be used "together for propelling in a forward and backward direction, "or sideways, or for steering vessels."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 25.—N° 820.

RENTON, AMHERST HAWKER, and COTTAM, EDWARD.—(*Provisional protection only.*)—Steering vessels.

The rudder is actuated by a double-acting hydraulic cylinder arranged so that the cylinder moves while the piston is fixed, the water being admitted to the cylinder through the piston rods. The water is forced in by a steam engine or otherwise, and suitable gearing is arranged so that the water may be admitted to or let flow from the cylinder on either side as required.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 4.—N° 965.

SCEALES, JAFFRAY. — (*Provisional protection only.*) — "Steering ships."

The following is the whole Provisional Specification:—
"My invention is intended chiefly to apply to the steering
"of ships of great length, and consists in fitting one or more
"rudders on the sides of the vessel in addition to the ordinary
"rudder. The additional rudder or rudders when not at
"work enter a recess or recesses formed in the ship's side to
"receive them, in order that there shall be no projecting sur-
"face to interfere with the ship's way when the additional
"rudder or rudders is or are not in action."

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 16.—N° 1104.

WARREN, FREDERIC PELHAM.—"Steering sea-going vessels."

The invention consists in fitting a rudder in a recess in the bows "in the forward 'dead wood' or equivalent part of the "vessel." The rudder is fixed at its forward edge on a shaft projecting up through the hull of the vessel, and when not in use lies entirely within its recess and apparently flush with the vessel's hull on both sides. If the shape of the cutwater does not admit of a rudder being thus hung, a false stem may be added, and a recess formed in it.

[Printed, 10*d*. Drawing.]

A.D. 1862, April 17.—N° 1119.

GRIFFITHS, JOHN.—(*Provisional protection only.*)—"Pro-
"pelling ships and other navigable vessels."

The following is the whole Provisional Specification:—
"My invention relates to that system of propelling by water
"where motive power, steam, or other engines are employed
"to work pumps or propelling cylinders, which take in and
"force out water through the hulls of the said ships or other
"navigable vessels, such water being ejected under the water
"line at an angle, or in direction towards the bow or stern,
"will cause a vessel to move in the opposite direction to the
"ejected current, ahead, astern, or otherwise, as desired.
"The pumps may be single or double-acting, and are placed
"by preference athwart ship, alongside direct acting engines
"in or about that part of the vessel deepest in the water.
"To each of the said pumps, if single-acting, are two commu-
"*nications* by tubes with the water outside the vessel, the

" terminations of which are made to direct the water taken in " by the action of the pumps or propelling cylinders, and dis- " placement of the vessel downwards, and at an angle to the " keel. In the tubes above-named, or in or about the tubes " or pumps, parts or the whole of which may be covered with " water confined in a tight compartment, are throttle or other " valves so placed and under the control of the engineer that " by moving the necessary levers he can alter or reverse the " course of a ship without stopping or reversing the engines."

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 19.—N° 1150.

LUMLEY, HENRY.—Rudder.

The improved rudder is made in two parts, a "tail" and a " body," which are connected together in the same way as the rudder is connected to the stern-post or in any other convenient way. The two are also connected by chains, two or more. A chain is fixed at a point in the stern-post, passes through a slot in the "body," and is fastened to the "tail," on the opposite side to that on which it is fast on the stern-post. Another chain is similarly fixed on the other side. The effect of this is, when the rudder is put over, to bring the "tail" still further over, into an angle with the "body." The rudder thus presents a concave surface to the water, and the resistance is increased.

[Printed, 8*d*. Drawing.]

A.D. 1862, April 22.—N° 1172.

JOHNSON, JOHN HENRY.—(*A communication from Jean Pierre Victor Le Rouge and Jacques Henri Charles de Berly.*)—(*Provisional protection only.*)—"Apparatus for " propelling and manœuvring ships."

The screw propeller shaft outside the vessel is jointed and worked by bevel gearing from a shaft actuated by any usual steering apparatus so that it may be turned at will in any direction to steer by. In sailing ships, a vane may be added to turn the shaft to such a direction as will work the vessel off a lee shore, and the propeller may be driven by the wind.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 30.—N° 1272.

LEIGH, EVAN.—(*Provisional protection only.*)—"Ships and "floating batteries."

Various improvements in these are described. Among others "paddle-wheel propellers work between pontoons "astern." The floats are of special construction. "The "paddles are detached and acted upon for steering purposes "if required."

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 8.—N° 1381.

LUNGLEY, CHARLES.—"Apparatus for manœuvring ships "and vessels."

The vessel is propelled and manœuvred by means of an oscillating blade or paddle. On a turn-table mounted in any part of the vessel, but preferably at the stern, is fixed a frame supporting a pair of quadrants. On these quadrants, so as to slide over them, is mounted the head of a shaft which passes down through a conical aperture in the turn-table and the vessel's bottom and terminates in a paddle. On this shaft just above the top of the opening is a boss. To the boss is pivotted one corner of a triangular frame on each side. The upper corner of each frame is attached to a connecting rod jointed by a universal joint to a stud on the head of the paddle-shaft. The third corner of each frame is connected by a connecting rod to the piston rod of one of a pair of steam cylinders. To the arms of the frames opposite the cylinders connecting rods are pivotted which are attached each to one of a pair of cranks on the shaft of a fly-wheel, and "one crank has the lead of "the other, to enable the blade to alter its position at the end "of each stroke" and be "feathered." If only one engine is used, the quadrant has on it a guide with "double grooves" in which a stud on the head of the paddle shaft slides to feather it for the return stroke.

The direction in which the apparatus acts is regulated by altering the position of the turn-table.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 10.—N° 1405.

MOORE, ROBERT.—Ship-building.

Among other matters the patentee employs "apparatus for "steering from below the water-line, without prejudice to "arrangements for transmitting power from the deck." Two methods of doing this are figured in the drawing. In one the plunger of a hydraulic ram is connected by chains directly to points on the rudder blade. In the other "transverse screws "driven by chains on pegged wheels," work in a channel across the hull, the "pegged wheels" being contained with cases open to the water, and being driven by apparatus within the vessel actuating their shafts which pass into the vessel through stuffing boxes. "As an auxiliary in steering" the inventor uses "centre boards or plates, one at or near the "bow, and another at or near the stern, so connected in their "action that the lifting of the forward one and the lowering "of the after one, and reversing, will make the vessel turn by "her stern and vice versa."

[Printed, 8*d*. Drawing.]

A.D. 1862, May 12.—N° 1424.

CARTWRIGHT, HENRY.—"Propelling and steering screw "steam vessels."

The external part of the propeller shaft is fitted with a universal joint, and has its after bearing in the outside edge of a skeleton rudder, consisting of three bars, one at top, one at bottom, and one forming the after edge of the rudder-blade. The rudder may be worked in any suitable way. By preference a quadrant on the rudder-head engages with a spindle on the axle of a toothed wheel in gear with an endless screw on a shaft driven by a donkey engine.

[Printed, 8*d*. Drawing.]

A.D. 1862, May 13.—N° 1448.

LATHAM, ROBERT MARSDEN. — (*A communication from David L. Allen.*)—"Steering apparatus."

A mitre pinion on the steering-wheel shaft gears with another on a vertical shaft, on which is a toothed wheel engaging with a toothed quadrant fixed upon the rudder-head. This quadrant and the cap on the rudder-head are preferably

in one piece, and the cap has a collar fitting in a ring bolted to the deck. The wheel which gears with the quadrant should be deep enough to allow the rudder to rise and fall within moderate limits without the wheel and quadrant being thrown out of gear.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 17.—N° 1506.

SICKELS, FREDERICK ELSWORTH.—"Steering vessels."

Improvements on N° 2410, A.D. 1859, in which a method of steering is described. In the present invention a crank shaft driven by a pair of steam cylinders has loosely mounted on it a barrel with which it is connected by a clutch box. On this barrel the tiller chains are wound. The slide valves for admitting the steam are worked by an excentric whose motion is limited by a stop. This excentric is fixed to a drum which is driven in one direction by a spring within it, and in the other by a cord wound upon it. The admission of steam can consequently be regulated by tightening or slackening this cord, which is led to a convenient look-out place, the steering apparatus being placed low down in the vessel out of the way of shot. A steering wheel may be fitted on this drum to act instead of the cord, or the tiller chain drum may be disconnected from the crank shaft, and the vessel steered by a hand wheel on this drum. Instead of steam, hydraulic or other power may be used. By marks on the cord above-mentioned the steersman can tell the exact position of the rudder.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1862, May 27.—N° 1590.

HAY, JOHN.—(*Provisional protection only.*)—War ships, &c.

An armour-plated vessel is described, both ends of which are similar. There is a propeller at each end "in a well or "opening near the stern," and "rudders are also provided "in spaces beyond each propeller, but within and protected "by each stern, there being also a strong guard which "protects both rudders and propellers from injury. The "steering is effected from the centre of the ship" in a shot-proof round-house furnished with windows for observation.

[*Printed* 4*d*. *No* Drawings.]

A.D. 1862, June 16.—N° 1782.

CURTIS, WILLIAM JOSEPH.—"Construction of screw pro-
" pellers."

The propeller shaft is connected with the propeller by a universal joint within the propeller itself and in a vertical line with the axis of the rudder. The after boss of the propeller is connected with the rudder, and the propeller works in a blank space cut out of the fore edge of the rudder and the after part of the stern-post and dead-wood. Then as the rudder is turned the propeller is directed to aid in steering while it revolves. Also the rudder may be dispensed with, and a " pendent arm or swinging frame attached like the rudder to " the stern-post" be used instead.

[Printed, 10*d*. Drawing.]

A.D. 1862, June 27.—N° 1881.

SMITH, ALEXANDER ANDERSON BLACK.—(*Provisional protection only.*)—"Steering ships."

"The rudder head is furnished with a 'tiller' or lever arm, " to which the ends of ropes or chains are attached which pass " in opposite directions around blocks or pullies carried by " arms or projections fixed to the deck or other part of the " vessel. From the sheaves or blocks the ropes or chains " pass to and around a grooved drum or barrel, to which the " other ends of the ropes or chains are fixed. The grooved " drum or barrel is carried by a vertical (or it may be in any " other position) shaft or axis supported in fixed bearings, " and on the upper end of this axis a toothed bevil wheel is " fixed, which takes into and is driven by a bevil pinion fixed " on a horizontal axis, upon which the hand or steering wheel " is fixed, and by which motion is communicated to the " rudder when required. In place of two ropes or chains " one may be employed, taking a sufficient number of turns " around the drum to prevent slipping, and, if desired, two " tiller arms may be fixed to the rudder head in place of one, " as described."

[Printed, 4*d*. No Drawings.]

A.D. 1862, July 11.—N° 2000.

MILLER, JAMES.—"Apparatus for steering ships."

The steering apparatus consists of a pair of vertical racks, placed opposite each other in the stern or other part of the ship, and having between them a pinion by the revolution of which one is raised as the other is lowered. Each rack carries on its lower end a vane which is lowered through a suitable aperture into the water by the movement of the rack. The racks are so placed that the vanes act one on each side of the keel and thus serve to steer the ship. The pinion which drives the racks is actuated by gearing from an ordinary steering-wheel. The vanes may be set at right angles or any other angle with the keel. Instead of the racks and pinion, a barrel and chain may be used.

[Printed, 8*d*. Drawing.]

A.D. 1862, July 25.—N° 2115.

SEYMOUR, JAMES, and HATCHER, DANIEL GEORGE.—(*Provisional protection only.*)—Steering ships.

The whole of the Provisional Specification is as follows :—"Our invention relates to the application of blades or surfaces to both sides of ships for the purpose of steering, either as an auxiliary to the ordinary rudder, or in case it should be carried away. These surfaces we prefer to place on each quarter of the ship at a sufficient depth below the water line, and we recess them in the side of the ship, so that when not in use they are flush, and present no obstacle to the passage of the vessel through the water. Each of these surfaces are mounted on an axis or pivot at the forward part, and have motion thereon similar to the action of the rudder; this may either be communicated through the axis itself or by a curved bar fixed to the plate or surface, and passing through a stuffing-box in the ship's side; the curve is described by a radius, taking the pivot as a centre. Motion is communicated to the curved bar by rack teeth and wheel gearing, or by levers, or otherwise actuated by a steering wheel or suitable apparatus. When it is desired to steer the ship by these blades or surfaces, one or other is projected from the side of the ship, according to the direction required, when the surface so projected presents an inclined surface

" on which the water acts, as on a rudder itself. The two " auxiliary steering apparatus may be worked in combination " or separately; they may also be used for stopping the way " of a ship, in which case they must necessarily be disconnected, " as they require both to be projected at the same time. One " or more of these steering surfaces may be fitted to each side " of the vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 5.—N° 2454.

SAMUEL, DAVID ARTHUR.—(*Provisional protection only.*)—Steering vessels.

The tiller points " 'aft' instead of 'fore,' as is usual, the " end of the tiller being provided with a vertical pin and " roller, which acts in a groove cut in a double-action lever; " this lever works on a centre pivot, and is forked at its fore " end, so as to receive a block of metal to slide in slots, through " which block a screw works, being set in bearings on each side " of the deck, thus when motion is imparted to the screw by " means of the steering wheel, the block and lever are brought " from the centre of the ship to the side required, and con- " sequently the rudder is turned accordingly by the other " extremity of the lever, the greater power being gained where " most required, the difference in the leverage being greater " as the rudder is moved towards either side. The steering " wheel may either be attached to the end of the screw at the " side of the ship or may be placed in the centre of the deck, " bevelled wheels being employed to actuate the screw."

In some cases the double-action lever may be dispensed with, and the screw passed through a block working in a slot formed in the end of the tiller.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 30.—N° 2652.

LE BRÉTON, ELIE JEAN MARIE.—(*Provisional protection only.*)—"Propeller for boats and ships."

The whole Provisional Specification is as follows:—"My " propeller can be worked by manual labor, steam engine, " or other power, and may be fitted to any part of a boat or " ship, and two propellers, one fitted at the stern to push,

" and the other at the bow to pull, may be advantageously " worked together. The propeller itself consists of two flaps, " hinged to an upright in such manner as to expand and " expose the whole surface of the flaps when being driven in " one direction, and to collapse and afford little resistance on " being drawn or driven in the reverse direction. The upright " to which the flaps are hinged is connected to rails protruded " horizontally from the boat or ship, on which it is free to " travel to and fro. The upright is prolonged upwards for " the reception of a shaft to which to-and-fro motions are " communicated by hand, steam engine, or other power. The " upright is capable of oscillation, for the purpose of causing " the propeller to steer as well as propel."

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 8.—N° 2714.

TERRY, CHARLES FREDERICK.—Propelling vessels.

In a suitable part of the vessel is fitted a cylinder, within which works a screw, a force pump, or other propelling apparatus. This cylinder communicates with the water by a tube leading down through the vessel's bottom, and by this means the screw, &c. is supplied with water. From the cylinder two tubes lead aft and two forward, one opening on each side of the bow and stern respectively. By means of slide valves, the issuing stream may be directed into any of these tubes, so that the vessel can be driven ahead or astern, turned in either direction, or stopped, without reversing the engines. Besides slide valves at the opening of the tubes into the central cylinder each tube is furnished with a " sluice valve " by which it can be closed when required. All these valves are operated by screws working in fixed nuts.

[Printed, 10*d*. Drawing.]

A.D. 1862, October 9.—N° 2722.

MAURICE, JOSEPH.—(*Provisional protection only.*)—Steering ships.

" These improvements consist in substituting for the ordinary " rudder, or as an auxiliary thereto, a sliding, traversing, " vibrating, or partially rotating surface of metal or wood, " *mounted* or fitted so as to work within a sheath or case, and

" capable of being projected into the water from the ship's " sides, port or starboard, according to the required change " of the ship's course. The projection or motion of the steering " apparatus should be at or about an angle of 90° with the " line of keel, that is, the steering piece (or pieces if there are " are two) or the surface of iron or wood projected from the " ship into the water, may either be moved out and in hori- " zontally, vertically, or at any intermediate angle thereto, as " it may be found most convenient to fit or apply the apparatus " to the ship; but the surface opposed to the water and to the " ship's progress is intended to be at or about a right angle " with the longitudinal axis of the ship's course, and with the " keel of the vessel.

" The apparatus may be placed at or near the stern of the " ship, amidships, or in any other convenient position, and " the sheath or case may be inserted wholly or partially into " the ship's side or bottom, or may pass therethrough."

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 16.—N° 2797.

HUMPHRYS, EDWARD.—"Steering apparatus."

This invention consists in " so combining apparatus for " acting by hydraulic power on the rudder of a ship or vessel " that the hydraulic cylinder and other apparatus intermediate " of it and the rudder may be all below the line of floatation, " and consequently out of the way of shot. For this purpose " an arm or projection is fixed to the rudder sufficiently below " the water line to protect it from shot. This arm is suitably " connected to the piston rod of the hydraulic cylinder, which " is also situated below the water line of the ship or vessel. " A stuffing box is formed through the stern of the ship or " vessel for the passage of the piston rod or of a connecting " rod, so that the communication between the piston of the " hydraulic cylinder and the rudder may be water-tight. The " arrangement for working the hydraulic pumps and apparatus " may be according to the means at present in practice or " otherwise."

" In ships built with very low overhanging 'counters,' in " place of passing the piston rod of the hydraulic cylinder " through a stuffing box" the spindle of the rudder may be

passed through a stuffing box, and the hydraulic cylinder &c., placed "above this stuffing box, but still below the line of "floatation of the vessel, the piston rod of the hydraulic "cylinder being by preference connected by a connecting rod "directly with an arm on the rudder spindle."

[Printed, 10*d*. Drawing.]

A.D. 1862, October 16.—N° 2798.

RANSFORD, HENRY.—Ship-building.

A ship of special construction is described. The inventor says, "in applying rudders to very long ships and vessels as "are now built" and especially to the vessels described "I "prefer to have one rudder near the stern but under the keel "or bottom" "on a shaft or axis passing through the bottom, "provision being made for the rudder shaft or axis passing "through a trunk or tube rising inside the ship above the "water line." "The rudder is to be affixed to its shaft or "axis so as to extend forward and aft thereof. A similar rudder can be used "at the after part of a ship." These rudders can be worked "separately or together or in conjunction with the "ordinary rudder."

In his Provisional Specification the inventor also says, with reference to the stern rudder, that such rudder is affixed to a shaft "arranged to turn in suitable bearings at the top and "bottom, and when necessary in an intermediate bearing or "bearings." Also "an addition is made to the lower part of "the rudder which is made fast to the shaft or axis at its lower "end, and such addition extends forward of the other part of "the rudder and below the bottom," "so that while the ordi- "nary rudder is fixed aft the stern, the lower or additional "part of the rudder extends considerably forward of the other "part of the rudder."

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 23.—N° 2857.

PERKES, MATILDA CARTWRIGHT ASTON.—(*A communication from Samuel Perkes.*)—"Equilibrium double-action revolving "rudder, self-balancing drag and improved steering gear."

The rudder has its shaft along its centre line, and the blade *on each side* thereof. It is pivotted below on a spur from the

keel, and the upper part of the shaft passes through a well-hole to the deck, and is supported in suitable bearings. The "stern " of the ship is slightly undercut or recessed, so as to receive " the rudder and allow it freely to revolve." The steering-wheel is by preference set with a vertical axis, and is connected by suitable gearing to a cog-wheel on the rudder-head. This wheel is of large size and is driven by a small pinion. The steering-wheel is of very large size and is turned by vertical handles on the upper side of the rim. At points round its circumference are holes into which pins from frames fixed on the deck may be pushed, to lock the wheel. If a wheel with a horizontal axis is used, it is of large size, and the lower part of it is received in a well or recess on deck of suitable shape. This well is lined with lead, &c., to render it water-tight, and has a drain-pipe to carry off water. The rudder may be of wood or metal or both; it is preferably of gun metal or cast iron "cored " out" for the sake of lightness. "The under side the keel " and rudder are slightly inclined each way to prevent hawsers " fouling it."

Any other steering apparatus may be used with the balanced rudder.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1862, October 31.—N° 2950.

SICKELS, Frederick Elsworth.—Steering ships.

A cranked shaft driven by a steam engine has upon it a barrel on which the tiller chains are wound. This barrel is driven by means of an "adjustable friction brake" consisting of segments of wood acting against a wheel on the face of the barrel which will slip round thereon when the amount of force applied is too great. On part of the shaft a spiral groove is cut, in which a stop works so that when the rudder is put over sufficiently far, the stop comes against the end of the groove and prevents the further revolution of the shaft. The slide-valves are worked by an eccentric actuated by a hand wheel by means of a cord wound on a drum on its shaft. This cord is attached to a weight which acts to shift the eccentric in one direction, while the winding of the cord on the drum shifts in the other. "To ensure the use of the least possible power " required to operate the steering apparatus the valve or valves

" which admit the steam " " to the cylinders is so connected " with the steering apparatus that while the steersman by " turning the steering wheel, opens the valve to admit steam " " the steering apparatus in moving will give this same valve " or valves a closing motion, and thus modify the extent of " the opening of the valve, and the rapidity of admission of " the steam."

"In order to instruct the steersman at all times as to the " position of the rudder, a wheel with different marks corre- " sponding to the different positions of the rudder can be used " to control the application of the power. These marks may " be made sensible to the touch by being made either in relief " or in intaglio."

[Printed, 3*s.* 6*d.* Drawings.]

A.D. 1862, November 13.—N° 3065.

KOPISCH, CARL GOTTLIEB.—"Improved apparatus for pro- " pelling, steering, and ventilating vessels."

This invention relates to an arrangement of apparatus whereby the propulsion of vessels may be effected through the injection into the water of " columns or streams of heated " air."

" The apparatus may be described as a furnace contained " within and extending from end to end of an elongated " horizontal steam boiler, below which is situated an air " reservoir. This reservoir is supplied with air by a pumping " or blowing engine " and the air may be drawn through pipes from the inside of the vessel so as to assist ventilation. The pumping engine is to be worked by steam from the boiler. " The air reservoir is brought into connection with " the ash-pit of the furnace by pipes which supply air under " pressure to the fire-place. The furnace is connected at its " rear end with a chimney by two openings of different dia- " meters, both of which are capable of being easily closed. " From the furnace also lead off air trunks, the outer ends of " which open into and below the surface of the water. These " trunks serve to conduct columns of air rearwards and direct " them into the water, and it is by the pressure of these " columns of air upon the water that the ship is propelled " *in any desired* direction." The air tubes are led to the

bows, to the stern, and to the sides of the vessel. They are all furnished with valves, and those at the sides are to be used for steering, the others for propelling ahead and astern.

[Printed, 8*d*. Drawing.]

A.D. 1862, November 27.—N° 3177.

PHELOUX, ANTOINE ALEXANDRE, and PAUMIER, PIERRE ARMAND.—(*Provisional protection only.*)—Propulsion of vessels.

The vessel is propelled by means of compressed air discharged from a reservoir "through blow-pipes placed tangentally to the side of the ship at an inclination varying "with the draught thereof and the speed required." "There "are two blow-pipes on each side of the ship turned towards "the prow, and two towards the poop." "Two blow-pipes "uniting into one near the reservoir, are placed on each side "of the rudder beneath the water line, and may in case of "accident to the wheel or tiller serve conjointly with the side "pipes to work the ship."

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 2.—N° 3231.

WHEATLEY, JOHN.—Construction of vessels.

An armour-plated vessel is described. It may be propelled by paddle-wheels which work independently so as to steer the vessel. "The rudder is to be supported by chocks, acting "like a common vice." There are "two screw chocks, one on "each side of the rudder, these being screwed will nip or hold "the rudder in a central position, or will support it in any "desired position, the chocks being more or less screwed up "as may be required.

[Printed, 8*d*. Drawing.]

A.D. 1862, December 2.—N° 3235.

GRAHAM, DUGALD.—(*Provisional protection only.*)—Steering ships.

A rudder is fitted at the stem, either in an opening formed therein or projecting forward from the stem. The rudder has its shaft placed centrally with the blade on both sides

of it, and works on a central pivot below in a bearing supported in a line with the keel. The shaft is carried on deck, where the usual steering apparatus is fitted. This rudder may be used either as a substitute for, or an auxiliary to, the ordinary stern rudder.

The ordinary rudder also may be "formed with an opening " in it in which is hung a secondary rudder corresponding to " the shape of the opening; suitable means are provided for " working the secondary rudder either independently or in " conjunction with the main rudder. In this way when the " main rudder is placed in an angular position by the steering " wheel, the smaller rudder turns upon its hinges like a door " and thus greatly relieves the pressure of the water upon the " larger one. The inner rudder is then moved over to the " same plane as the larger one by means of a secondary wheel " or other equivalent actuating contrivance. In lieu of this " arrangement the rudder may be divided into two parts, " which are so arranged that either part may be put in motion " either separately or conjointly; the object of the arrange- " ment being in both modifications to lessen the difficulty of " steering large ships by causing a portion of the rudder to " be actuated in the first instance, and this to be followed, " if necessary, by the motion of the second part."

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 13.—N° 3344.

HENRY, MICHAEL.—(*A communication from Jean Pierre Victor Le Rouge.*)—"Applying propellers to ships and other " vessels."

The object of the invention is to enable the propeller to be turned from side to side like a rudder, so that it may help to steer the vessel.

A projecting frame at the stern carries a vertical shaft loosely fitted therein. To this shaft is fixed a swinging frame which carries the propeller, the propeller shaft passing through the frame and bearing against a boss on the above-mentioned vertical shaft. By means of a toothed segment engaging with a pinion on a steering shaft, the swinging frame and the propeller can be turned about after the manner of a rudder. *A bevel wheel* on the main shaft engages with another on the

vertical shaft, and this with a third on the propeller shaft, so that motion may be imparted to the propeller at any angle. To protect the gearing, a "conical shield" is fitted in front of it.

A modification is described, in which the propeller can be raised or lowered. This is in the main similar to the above-described apparatus, except that the bevel wheel on the main shaft gears with a bevel wheel which slides on the vertical shaft but does not revolve on it, and a second wheel on this shaft gears with the bevel wheel on the propeller shaft. The frame and propeller may thus rise and fall in grooves fitted for the purpose without the engine being stopped. To allow of this the pinion on the steering shaft is of considerable length.

[Printed, 6*d*. Drawing.]

A.D. 1862, December 18.—N° 3393.

NEWTON, ALFRED VINCENT. — (*A communication from Julius Ferdinand Rochow.*)—"Apparatus for transmitting "power."

The apparatus is applicable for steering and other purposes. It is described as "consisting in the arrangement of two cog-"wheels," one secured to the drum of a steering apparatus, and the other stationary. "In combination with these cog-"wheels are pinions" "attached to a tumbling shaft, which "is carried round the drum shaft in such a manner that on "rotating the wheel or drum shaft, by the combined action of "two pinions on the tumbling shaft, and the differential "wheels, a slow rotary motion is imparted to the drum."

In the drawing a steering apparatus is shown. A drum is mounted loosely on the steering-wheel shaft; within the drum fits a cog-wheel with internal teeth, the axle of which is firmly secured to one of the standards of the apparatus; this axle is hollow, and the steering wheel shaft passes through it, while the axle of the drum works round it. A second similar wheel within the drum is connected therewith by projections on the drum fitting in grooves therein. These are packed with india-rubber. Two pinions on a "tumbling shaft" mounted in bearings carried by the shaft, gear one with each wheel. When the shaft is rotated, the pinion in gear with the fixed wheel is

caused to revolve ; this rotates the other pinion, which causes its wheel, and consequently the drum to which it is attached, to revolve. By altering the relative numbers of the teeth in the pinions and wheels, the power may be multiplied or made slower as required.

[Printed, 8*d*. Drawing.]

A.D. 1862, December 20.—N° 3403.

HARVEY, Frederic William. — (*Provisional protection only.*)—"Fitting and connecting rudders."

The object of this invention is to afford greater facility for shipping and unshipping rudders. The inventor says :—

"The means by which I propose to effect these improve-
" ments are as follows :—Along the edge of the stern-post of
" a ship I form a circular-shaped groove or channel, with a
" slit or opening along same, and the bottom thereof I form
" solid and circular ; said groove and channel is intended to
" receive the shaft of the rudder, which should be formed
" cylindrical, and fit easily therein. I also form an opening
" through the deck of the ship, sufficiently large to receive the
" rudder, which has simply to be lowered from the deck
" through said opening, the shaft of the rudder being securely
" guided by and held in the grooved channel aforesaid. By
" these means the use of 'pintels' and 'gudgeons' at present
" used for connecting rudders to ships are entirely dispensed
" with. To the top of the rudder-post I connect a swivel cap,
" and the well-known right and left-handed screw steering
" tackle to that end of the screw of said tackle situate
" furthest aft, I connect a long pin vertically, said pin passing
" through a hole in a stand, and fixed to the ship's deck, so
" that upon the rudder striking upon any substance, the
" rudder will be lifted, and with it the steering tackle and
" wheel, the long pin aforesaid serving as the fulcrum for
" the said tackle to move upon. Upon the obstruction being
" removed, the rudder and tackle will descend to their normal
" position by their own weight. I propose to adapt tiller
" ropes to the shaft of the rudder in case of accident to the
" screw steering tackle aforesaid, and to connect same to an
" arm fixed on the rudder shaft, said arm serving also to
" *indicate* the true position of the feather of the rudder

" during the steering of the vessel. These improvements are " especially adapted for iron ships."

[Printed, 4*d*. No Drawings.]

1863.

A.D. 1863, January 8.—N° 66.

GROGAN, RODERICK. — (*Provisional protection only.*)— " Propellers for vessels driven by steam or other power."

Vanes are so geared to the propeller shaft as to have a feathering motion imparted to each, while it has also a rotatory motion round the shaft as an axis. The inventor says :—" I " also use a flexible rudder of same shape and motion as " present one, which motion when made to vibrate rapidly by " being connected to the required mechanism (of ordinary " construction) will propel as well as steer vessels."

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 12.—N° 98.

MAHON, ARTHUR IRWIN.—(*Provisional protection only.*)— Propellers, &c.

Several sorts of propellers are described. Of these one is a " submarine propeller," capable of steering, stopping, or " backing a vessel without interfering with the work of the " engines." This appears to be effected by means of moveable " shields," which divert the water from one side or other of the propeller.

[Printed, 4*d*. No Drawings.]

A.D. 1863, January 23.—N° 210.

GISBORNE, FREDERIC NEWTON.—" Communicating signals " on board ship."

A method of signalling to the helmsman by electricity is described. There is also an apparatus connected to the rudder for showing at any part of the ship required the position in which the rudder is. Round the rudder-head is a metal ring divided into sections, each section being in electrical communi-

cation with an indicator in the position required. A metal bar on the rudder-head moves on this circle, so as to form connection with the indicator corresponding to each position of the rudder. The circuit may be broken and closed by a break knob which is pressed when it is desired to observe the position of the rudder.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, January 27.—N° 238.

GREEN, Richard Augustus Willoughby. — (*Provisional protection only.*)—"Light rowing boats."

A boat of this character for sculling or rowing is described. The inventor says :—"At the stern point I apply a small "copper pin projecting downwards to render her steerage by "the sculls more easy, and to prevent her twisting about too "much."

[Printed, 4*d.* No Drawings.]

A.D. 1863, February 6.—N° 334.

JOHNSTON, Alexander.—Propulsion of vessels.

The vessel is propelled by the action of one or more pairs of plungers working in cylinders open to the water below the water-line. For steering purposes one or more pairs may be placed at the bows to act in concert with others at the stern or elsewhere. By working the propellers on one side at a greater speed than those on the other, or by stopping those on one side, or by working the bow propellers on one side, and the stern propellers on the other, the vessel may be steered.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, February 11.—N° 377.

HUMPHRYS, Edward. — (*Provisional protection only.*)—Steering ships.

Hydraulic power is used for steering, the tiller being worked by a hydraulic cylinder in any usual manner. The steering is effected from the bridge where there is "a slide valve "contained in a chamber, and this is connected with pipes "which are led away to each end of the distant cylinder; "the valve chamber also communicates with the accumu-

"lator." This valve is worked by the steering lever, and the supply of water to the cylinder governed thereby. The connecting pipes are laid in a covered groove along the deck, and in the same groove there is "a rod which moves with "the rudder, and actuates an indicator placed near the "steersman."

[Printed, 4*d*. No Drawings.]

A.D. 1863, February 24.—N° 508.

WILLSON, Hugh Bowlsby.—(*Provisional protection only.*) —Ship-building.

Vessels of peculiar construction and nearly flat-bottomed are described. "In order to steer ships of war constructed in "this manner, and more especially such as are intended to "go either end foremost, and to be used as rams," two rudders are used, which "are placed in a line with the ship's "keel between the ends of the great central girder and "the vessel's ends, mounting them so that they may be raised "into chambers in order that only one may be used at a time "if desired, or into which they will be pressed upwards in "case of coming in contact with the bottom." "Each "rudder is mounted on a pendent vertical spindle or stock "which passes down from the wheel-house and is suspended "by weights which nearly counterbalance it. This spindle "turns freely in a bottom bearing that works in vertical "guides in the chambers intended to receive the rudder. "When, therefore, the rudder meets an obstruction, the "bottom bearing, with the spindle and rudder, being nearly "balanced by the weights, will be pushed upwards by a "small degree of pressure. The weights are prevented from "oscillation when the ship rolls or pitches by vertical "guides."

[Printed, 4*d*. No Drawings.]

A.D. 1863, February, 28.—N° 571.

SYMONDS, Thomas Edward.—Screw ships.

Various improvements in screw steamers are described. In iron screw vessels with double keels, a rudder is placed "in "the line of each keel, and nearly in a line with each screw "shaft." The tillers are connected together "so as to enable

" them to work simultaneously, but they may be readily " disconnected for the purpose of being worked separately." In the drawing rudders are figured of two different shapes, one the ordinary description, and the other a rudder of small depth vertically, fitted below the propeller shaft, and just forward of the propeller.

[Printed, 8*d*. Drawing.]

A.D. 1863, March 3.—N° 587.

SYMONDS, THOMAS EDWARD.—" Steering ships."

The steering-wheel shaft has on it a pinion which drives cog-wheels on two parallel grooved drums. If necessary the drums may also have teeth for holding the chains. The tiller chain " is made to pass round both drums in the several " grooves " " therein, and is led off right and left, or top and " bottom " (according as the drums are beside each other or one above the other) to the tiller. " A cone friction break " worked by a lever or treadle " is used, and when there are two steering-wheels on the same shaft, " two friction " breaks may be applied and connected with the same lever " or treadle, and the cone friction breaks may be separated " or withdrawn by a single lever." Instead of iron, which affects the compass, gun-metal may be used for the framing and gearing, and " white metal bushes may be employed in " the bearings."

The size of the rudder blade may be increased by an additional piece, which slides between the double plates of which the rudder is formed. It may slide either vertically or horizontally, and may be projected and withdrawn by screws working in nuts, and if necessary turned by a shaft connected with them through bevel gearing, or by a rack and pinion, or by a chain worked by a screw turning in a fixed nut, and having the chain attached to its end. In any case, the rudder-shaft is hollow, and the raising apparatus contained therein. The rudder may be of the usual shape, but a rudder is also shewn of the shape described in No. 571, A.D. 1863. The additional piece may also be double, and slide on a single central plate in grooves.

The rudders are by preference made of " wrought-iron " framework, and hollow or open," and " the sides of the " *rudder frame* " are closed " by means of side plating

" screwed or rivetted upon each side of the frame." "Or the " plates may be made to slide vertically into V or other " shaped grooves formed in the frame."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, March 16.—N° 707.

SMETHURST, JOHN. — (*Provisional protection only.*)— Ship-building.

A vessel is described which has two, three, or more keels. Where there are three or more keels, there is "suspended a " swivel rudder fixed to a vertical shaft firmly supported by " bearings in the interior of the ship or vessel, which said " rudder will be so formed that where the blade or thin edge " of the same is placed at right angles with the ship or vessel's " side it will exactly fit the space between the two keels, each " rudder will be worked by a separate wheel, but so arranged " nevertheless that one man " " can work both rudders. Thus " if the ship or vessel is desired to move to some place on the " right or left hand (as the case may be), the rudder on the " same side as the point in question would require to be placed " at right angles with the ship or vessel's side; the other " rudder being, however, parallel with the central line from " fore to aft of the ship or vessel, whilst the thin edge only of " the latter would cut through the water, the broad flat side " of the former rudder would forcibly resist the water, and " thus bring the ship or vessel's head round."

[Printed, 4*d.* No Drawings.]

A.D. 1863, March 31.—N° 831.

COE, ERNEST OSWALD. — (*Provisional protection only.*)— " Propellers for ships and other vessels."

Wheels of corrugated metal, &c. are used for propelling. Each propeller may consist of one or more wheels on a shaft, fitted at any suitable angle to the shaft. They may be fitted at the sides, in the usual position of paddle-wheels, or at the stem or stern, or both. They may be suited for steering purposes "by certain adaptations of their form, and by fixing " them transversely, either at the stem or stern of the vessel, " or at both, and may be used either conjointly with an " ordinary rudder or otherwise."

[Printed, 4*d.* No Drawings.]

A.D. 1863, April 8.—N° 888.

GEDGE, WILLIAM EDWARD. — (*A communication from Hilaire André Levallois.*)—(*Provisional protection only.*)—"Apparatus for propelling and navigating small craft."

The invention comprises several modes of using reciprocating motion for oars. One of the improvements "consists in an "apparatus which may be termed a rudder oar; it is composed "of a lever carrying two iron guides, which guide a paddle "up and down; the paddle is set in motion by a chain passing "over a grooved roller fixed on the elbow of the lever. This "chain is continued by an iron rod sliding in a groove in the "arm of the lever which is inboard, and at the other end of "this rod is connected another small chain, which rolls round "a pulley large enough to describe in its rotation a distance "sufficient to raise the paddle from the water. The paddle "guides and the arm of the lever are connected by two iron "tie pieces hinging on a pivot, on which the entire apparatus "is supported and balanced. The pulley above-mentioned is "connected to the lever by two angular half flat pieces of "metal, and carries a handle or crank, a turn of which, aided "by the chain, completes the course of the paddle. On the "opposite side of the pulley is another handle, which aids the "return of the paddle towards the boat. The advantages of "this oar are facility of progression, either backwards or for-"wards, while acting as a rudder, for which purpose it is only "necessary to make it diverge obliquely from the right to the "left, or vice versa. A double rudder propeller may also be "used, composed of a lever, guides, and paddle as above "described, but furnished also with a piece of wood sliding "on friction rollers, supported also on a small plank, which "is fixed to a pivot on the side of the boat, and by the exten-"sion of a ring or hook on a bracket on the half deck. An "iron pin, which may be removed at will, secures the whole "in position. At the end of the piece of wood is a pulley, as "in the previously described arrangement, its inner handle "acting as a crank, on turning which the recoil movement of "the propeller is obtained, that is to say, the forward motion, "all the parts being seated between these two organs, and on "turning round the other handle an opposite motion is pro-"*duced.* The handle comes against an iron elbow when it

" has described its proper course, so that it may not go " further. When this arrangement is applied to boats or " barges having no half deck, the balancing arrangement " of the first described rudder propeller is adopted, with this " difference, that it only balances and does not pivot, and two " organs are used instead of one, so that if one only be moved " the boat will sheer to the right or left while still advancing."

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 25.—N° 1034.

DUNBAR, JAMES, and WOODFORD, JOHN WYMEN.—" Ap- " paratus for steering and manœuvring ships and vessels."

The ship is steered by a blade fixed centrally on a vertical shaft about amidships. This blade is placed just below the bottom, and above it is a chamber into which it can be raised. This chamber can be closed by a valve, so that the blade can be examined when therein. The valve slides horizontally, and is operated by a pinion and endless screw. The shaft and steering blade can be turned by steam power. In describing the way in which the apparatus acts, it is stated that "the " shaft or axis is acted on by steam or other power to give " rotatory motion thereto, in order that the axis or shaft and " the blades or vanes fixed thereto may be caused to rotate " towards the right hand or to the left, according to the " direction in which it is desired that the vessels should be " steered."

[Printed, 1*s*. Drawings.]

A.D. 1863, May 5.—N° 1124.

GLOVER, WILLIAM.—Steering ships, &c.

A chain led round a barrel on the steering-wheel shaft is carried over suitable pulleys, and thence round a wheel on the rudder-head, to which it is attached by a screw coupling at one end and by a bolt at the other. When increased power is required, a small drum on the steering-wheel shaft drives a larger drum by means of an endless chain. On the shaft of this second drum is another small drum, a chain from which works the rudder as above. " A brake may be applied."

[Printed, 1*s*. Drawings.]

A.D. 1863, May 16.—N° 1231.

TALBOT, ROBERT.—"Rudder for steering barges."

The rudder is a folding one, so that it can be shortened when the barge is passing a lock in a river, or when in sea-going vessels the weather is rough. The rudder is formed in two parts divided vertically. The forward part is formed of two parallel iron plates, between which the after part, formed of a single plate, can be received. The forward part is attached to the stern-post in the usual way, and has the after part attached to it by a pivot at its lower after corner. Above, the two parts are connected by a pin in the after part, which slides in a slot in the other part. A catch hinged to the forward part lets down so as to take into a notch in the other part. This can be raised by a chain, as can also the after part, the chain being fixed to its lower after corner.

[Printed, 1*s*. Drawings.]

A.D. 1863, May 28.—N° 1340.

CARTWRIGHT, HENRY.—Steering vessels.

A screwed shaft has on it a nut pivotted to the end of the tiller. This shaft is supported in bearings at one end, and has upon it near that end a universal joint, so that by the action of that joint and the pivotted nut, the shaft may accommodate itself to every position of the tiller. The shaft may be driven in various ways by gearing from a hand wheel or otherwise, but preferably from a crank shaft driven by a small engine.

[Printed, 8*d*. Drawing.]

A.D. 1863, June 13.—N° 1484.

MÉHU, AIMÉ.—(*Provisional protection only.*)—"Helm for "working the rudders of ships or vessels."

The following is the whole Provisional Specification:—"The invention consists in a mechanical contrivance for "imparting motion to the rudders of ships or vessels, by "which tiller ropes or chains, pullies, and their appendages "will be dispensed with. It is composed of very few pieces, "*consisting* of a clasp or hoop fitted near the top of the "*rudder shaft* or head, from which hoop projects horizontally

" a stem or bar expanding into a socket at the end furthest " from the rudder head, the said socket receiving freely a " vertical lever carried by a shaft provided with a cog wheel " which is actuated by teeth cut on the shaft of the ordinary " steering wheel. The action is as follows :—

" On turning the steering wheel to the right or left the " teeth cut on its shaft gear into the cog on the shaft carrying " the lever, which latter acts on the horizontal stem projecting " from the hoop on the rudder head, and the rudder obeying " the impulse thus given steers the ship."

[Printed, *4d.* No Drawings.]

A.D. 1863, June 13.—N° 1489.

ROBSON, SAMUEL SINCLAIR.—Steering apparatus.

Several modifications of the invention are given, but they all consist of different methods of applying "the differential " motion and power obtained by winding up the one part of a " rope or chain on a barrel and unwinding the other part " from the same barrel, but which is of a different diameter."

In the first arrangement described a horizontal shaft across the vessel, driven by gearing from a steering-wheel, is fitted with two of these "compound barrels," one at each end, and from each of these a chain passes over a pulley at one end of a yoke on the rudder-head. "By making the barrels with " double inclines, the large one being largest in the middle, " and the small one opposite (smallest in the middle)" the greatest power can be applied to the rudder when it is most required.

Instead of acting directly on the tiller, the barrel chains may pass over blocks attached to the tiller by chains.

Instead of two pair of barrels and two chains, a pair of whelp-wheels and one endless chain carried to both ends of the yoke may be used.

The whole apparatus may be mounted on the rudder-head and the chains led down the tiller, over pulleys thereon to fixed blocks at the sides of the vessel and back to the end of the tiller.

The second part of the invention relates to an auxiliary rudder. A shaft is mounted horizontally in bearings in the dead-wood. It is capable of rotation by means of suitable

levers, &c. On the shaft are fixed plates at an angle of about 45° with the horizontal. When these plates are in their normal position with their edges to the water they produce no effect, but by rotating the shaft they partly present their faces thereto so that the ship is steered according to the direction in which these plates are turned.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, June 20.—N° 1557.

WINANS, WILLIAM LOUIS, and WINANS, THOMAS.—"Adapting propellers for propelling ships or vessels for ocean "navigation."

The invention refers to "the adaptation to and combination "with a spindle-shaped hull, such as was invented by Ross "and Thomas Winans, and patented 19th June 1858, N° 1386, "of a screw propeller placed at one end of the vessel, or "two screw propellers, one placed at each end of the vessel." When one propeller is used, the inventors prefer to place it "on the forward end of the vessel, with one of the rudders "of large size a short distance in rear of the propeller, in "order to partially counteract the tendency of the end of the "vessel to move laterally by the action of the propeller." When two propellers are employed, a rudder is placed aft of the forward propeller, and a second rudder before the aft propeller. The shaft of each rudder passes up through the bottom of the vessel, and to its upper end is attached a forked lever, which embraces the propeller shaft, and by which the rudder is worked. These rudders may be fixtures to serve as fins, and a separate rudder be used for steering. Also the inventors may "employ one or more fins, projecting down "from the hull a short distance astern of the wheel."

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1863, June 22.—N° 1570.

WINANS, WILLIAM LOUIS, and WINANS, THOMAS.—Propelling vessels.

The invention relates to improvements on the spindle shaped *vessel described* in former Specifications by the inventors and *others.*

The vessel is formed in three compartments, and a propeller of special construction is fitted to each end of the central compartment between it and each of the end compartments. The propellers are on separate shafts and worked independently, so that they can be used to steer the vessel.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, July 8.—N° 1691.

MYERS, EDWARD, and FORBES, HUGH.—"Propelling and "steering ships."

A pumping apparatus is placed below the water line, in connection with two parallel tubes running from stem to stern one on each side of the keel. By drawing in water at the bows, and expelling it at the stern the vessel is propelled. "The "apparatus consists in a pair of tooth drums or wheels working "in a suitable case formed for the purpose, which teeth of "drums or wheels work into each other in a suitable manner, "so that the water passes around the exterior of said drums "or wheels, and thus is drawn from the stem orifice, and is "forced out of the stern orifice of the tubes which are con-"nected with the apparatus. The drums or wheels are caused "to rotate by steam or any other motive power. By reversing "the action of the apparatus the current of water becomes "also reversed, and the vessel is made to go stern forward. "The steering of the vessel can be performed by transverse "tubes running from right to left, connected with the two "already described, which connection can, however, be at "option cut off. The action of these transverse tubes for "steering enables the current drawn in at the orifice under the "left bows to be driven out at an orifice on the right flank "near the stern, or that drawn in under the right bows to be "expelled at an orifice in the left flank near the stern." The tubes may be "capable of contraction" near the outlets. They are fitted with valves by which the connection may be cut off when required.

[Printed, 10*d.* Drawing.]

A.D. 1863, July 11.—N° 1734.

RUTHVEN, MORRIS WEST.—Rudders.

"The rudder is composed of three or more moveable parts "like so many separate rudders hinged to each other. In

" order to cause these separate hinged parts to form an approxi-
" mate curve when the rudder is put over to 'starboard or
" 'port' a lever is attached to each part and has a pin or slot
" in one end which works in a slotted piece or pin secured to
" the preceding part, and this arrangement is carried out and
" repeated through the entire series, the lever of the second
" part working in a slotted piece or pin secured to the stern
" post itself. In place of the pin or slot of each lever working
" in a slot or pin in the adjoining part, all the pins or slots of
" the several levers may be made to work in one and the same
" piece secured to the stern post, which piece is provided with
" slots or pins as the case may be." The drawing shows the levers all arranged each at the top of its own piece, so that they all act along the upper part of the blade.

[Printed, 10*d*. Drawing.]

A.D. 1863, July 16.—N° 1781.

TAYLER, Joseph Needham, and AUSTIN, William.—Ship-building.

Among other improvements the rudder is made of separate pieces, arranged longitudinally, and each piece having a feather along its edge fitting into a rebate in the edge of the piece before it. The whole is secured by bolts "horizontally or " crossways." The stern-post has on it an iron casing in which is a dove-tail groove. Into this groove a sliding piece fits, on which are metal eyes; similar eyes are fixed in the rudder-stock, and the rudder and stern-post are connected by a pin passed down through these eyes.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, August 7.—N° 1955.

WATSON, Edward. — (*Provisional protection only.*) — " Apparatus whereby screw propellers may be made to steer " as well as propel."

The inventor says :—

"The apparatus consists of a socket in which I form two or " more radial slots, and a ball upon which I fix two or four " arms according to the number of slots in the socket. I " insert the ball in the socket, and secure it by a cap through " *an aperture in* which that part of the shaft connected to the

" ball passes. The socket is connected to the main screw " shaft, and the ball to a shorter shaft, which has a bearing " in a frame free to move on an axis passed through or into a " metal bar projecting or carried back from the keel, the " upper part of the frame carries a toothed wheel or other " arrangement, whereby it may be turned. By turning the " frame as a rudder, the screw will also be turned, and conse- " quently while propelling will steer the ship.

"In some cases I connect the screw blades directly to and " carry them through the case of the socket, and move them " therein, when the socket will act as the boss of the pro- " peller."

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 8.—N° 2210.

HEWITT, WILLIAM.—Rudder.

The rudder is fitted below the water line. It consists of two blades "united by bolts, rivets, or otherwise. They are " bowed outwards at or about the centre, and are carried round " a boss fixed on a main shaft, the outer end of which pro- " trudes beyond the vessel, the blades are also so shaped as " to fit into the boss at their inner ends while their outer ends " are furnished with pintles, that on the lower blade is received " and is free to move in a step carried out from the vessel, " while the pintle on the top of the upper blade enters an eye " formed to receive it on a metal bearing fixed to and carried " out from the vessel. A toothed wheel is let in and fixed to " the upper part of the boss into which a bevilled toothed " pinion gears. This pinion is keyed on a hollow shaft which " is carried inboard through a stuffing box over the main shaft " and has keyed on it a wheel with three sets of teeth; one " of these sets of teeth is placed in gear at will with a toothed " pinion on a shaft communicating with the engine room, or " with another pinion on a shaft carried between decks, or with " a third pinion on another shaft communicating with the " deck. When either of these pinions is set in motion, the " hollow shaft through the bevelled toothed pinion sets the " toothed wheel on the boss in motion and turns the blades " of the rudder."

[Printed, 10*d*. Drawing.]

A.D. 1863, September 9.—N° 2213.

TUCKER, WALTER HENRY. — "Propelling and steering "vessels."

The first part relates to propelling vessels and steering them by the propeller. For this purpose the propeller is mounted on a short shaft carried by a vertical cylinder. This cylinder is pivotted on a foot below, and can be revolved by gearing from a steering-wheel. On the shaft within the cylinder is a crank, driven by a connecting rod from a crank on the engine shaft. To enable the motion to be transmitted to the propeller while it is turned to either side for steering purposes, this connecting rod is jointed so that one piece of it can rotate within the other. Eccentrics also on the main shaft transmit motion to a collar surrounding the above connecting rod, and other connecting rods with jaws sliding on this collar actuate eccentrics on the propeller shaft. A similar result may be attained by means of drums and endless bands. In the last part a rudder is described. This consists of a curved blade (like a segment of a cylinder of large radius with its axis vertical) in the centre of the top of which is fixed a tiller, this tiller projecting radially inwards. The tiller at its other end is pivotted on a fixed point. The rudder is arranged in a suitable casing at the stern with its convex side looking forward and the tiller towards the stern. It may be actuated by any suitable means so as to be slidden out into the water on either side of the ship. It is also supported at its central outer point by a friction roller working on a segmental guide. "One or more such rudders may be used on each side of a "vessel, and at either or both ends." Also the inventor uses "one or more rudders mounted on horizontal shafts, so that "they shall project laterally from a vessel, and move into and "from the water edgewise."

[Printed, 10*d*. Drawing.]

A.D. 1863, October 5.—N° 2431.

STANLEY, JOHN MARTIN, and STANLEY, JABEZ. — "Im- "provements in propelling."

An engine of special construction is described, by which a *stream of* water can be driven through a tube or channel

running along the hull near the keel. By the reaction against the external water of this stream the vessel is propelled. For steering purposes there are branch tubes leading from this main channel at the bows and stern, and opening in the sides of the vessel. Into these the stream of water can be directed as required by suitable valves. A special steering apparatus of this description may be fitted to vessels propelled by the screw, paddle, &c., and even to sailing vessels, by the use of an auxiliary engine.

The above would appear to comprise all that refers to the present series in the Final Specification. In the Provisional the inventors also say :—"in lieu of these lateral openings " for turning the vessels, we propose to place propeller, steer- " ing and turning rudders, which may by being turned to the " right or left give the necessary turning power. These " rudders are made in duplicate with an opening between " them, through which opening the water issuing from the " propeller passes. These rudders are coupled, and turned " simultaneously, and may be used for general steering pur- " poses in lieu of the ordinary rudders." A description is also given of the "stop valves" used for opening and closing the outlets as required in the following words :—"At the " junctions of the main and hauch tube flanges are formed, " between which a rotating faced plate is fitted. In this " rotating plate we form a perforation of the same size as " the tube and hauch. We cause this plate to rotate upon a " centre so that the centre of the opening as the plate is " turned shall pass through the two centres of the main and " branch tubes ; the latter are joined by limbs or luggs, which " project beyond the flange and also beyond the periphery of " the rotating plate, so that when bolted together the face " flanges can be sufficiently tightened to make the plate work " water-tight. This plate on being turned to the right or left " opens or closes the main and hauch as desired. For turning " these plates their outer edges are cogged or toothed, and " have a spur wheel in gear therewith. The whole of these " plates and spur wheels are so geared that the direction of " the propelling current may be changed by one motion either " by hand or steam power."

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1863, October 28.—N° 2673.

KENNEDY, JOHN.—"Improvements in the construction of "ships of war and other vessels, and in masting and rigging "the same."

A double hulled man-of-war is described, fitted with propellers, "upon the double after-ends," preferably of the construction described in No. 1527, A.D. 1862. The object of this is to move the ship's head so that each broadside can be delivered alternately. Ships with "double after-ends" may have "double rudders, one under each quarter" "inside the "propeller or before it and above the propeller shaft, say, "between it and the loaded line, the rudder shafts being "carried up and worked either together or independently of "each other, its broadest part being at the loaded water line, "and its narrowest part at the lowest portion next the shaft "of propeller."

[Printed, 3s. Drawings.]

A.D. 1863, November 5.—N° 2749.

SICKELS, FREDERICK ELSWORTH.—"Steering and turning "vessels."

There are sixteen different heads in this Specification, some of which are connected with marine propulsion and some with steering.

1. When the rudders are operated by power, a "supple-"mentary engine" is used to reverse the action of the propelling engines.

2. An indicator worked from the engines is placed near the steersman.

3. An "extension rudder," of any suitable description, may be combined with an engine for operating the rudder by power.

4. Rudders may be made with "swinging leaves or "shutters." The shutters may be arranged like the leaves of a venetian blind, and pivotted on horizontal spindles. There is a set on each side of the rudder, and their action is controlled by a series of stops on a sliding bar on each side, the bar being capable of being raised by a lever, &c. near the rudder-head. For the bar a chain may be substituted. Also, a flap may be *hinged to* the after edge of the rudder and be held by catches *at either side,* so that the flap may swing in one direction, or

in both directions, or be held firm. The shutters may be fixed on a frame which can be unshipped from the rudder. "Elastic "pads" may be fitted on the stops. When cords are used for working the shutters, they pass through caoutchouc tubing to render water-tight the aperture in the vessel's side.

5. The rudder may be used as a propeller by being oscillated. "One or more rudders can be used, and they may be "located," as required.

6. A "loose collar" on the rudder-post fits over and secures the opening in the stern.

7. The rudder-chain is led over friction pulleys arranged "in a curve struck from the rudder-post." The end of the tiller is bent downwards "so as to lead to the steering gear."

8. "To prevent the steersman from moving the rudder too "far either way" there is a "stop on the valve motion."

9. An indicator worked by the rudder is fixed near the engineer. There is also (as before stated) an indicator from the engines to the steersman.

10. An "extension piece" is attached to the rudder. This is formed of two plates which embrace the rudder one on each side. It is supported by hooks resting on pins in the rudder-blade and is secured by a catch which can be drawn out by a line, or it may be pivotted to the bottom of the rudder and have a rack above with a pall that holds it in various positions.

11. "To bring the rudder admidships" there is a weight or spring arranged "to act on the valve motion when it is "liberated from the control of the steersman."

12. A hand steering apparatus is made "to operate through "a friction break," so that in working by hand a large rudder "calculated for power" blows on the rudder may not be transmitted to the steering gear.

13. An engine used to work the rudder may also reverse the propelling engines.

14. Propeller blades are made of vulcanite.

15. Rudder blades are made of vulcanite, the stock being of metal.

16. When the rudder is worked by power, it may be operated by a "friction connection," such as a strap, &c., which will yield to any sudden strain.

[Printed, 6s. 4d. Drawing.]

A.D. 1863, November 9.—N° 2780.

COCHRANE, ARTHUR AUCKLAND LEOPOLD PEDRO.—"Propelling and steering ships."

A jet of steam is directed into a tube of larger diameter than the steam tube, and either open at both ends to the water, or open to the water at the end opposite the steam pipe, and fitted with a number of openings at the other end to admit water. The vessel is propelled by the reaction of the current thus produced against the external water. Several allusions are made in the Specification to the use of the method for steering as well as propelling, but no special adaptation to the former purpose is given.

[Printed, 6*d*. Drawing.]

A.D. 1863, November 11.—N° 2807.

STAINTON, MATTHEW, and LAWSON, DANIEL. — (*Provisional protection only.*)—"Apparatus for steering ships."

A steering-wheel is used "on the axis of which is a drum. "A rope takes several turns around this drum, and passes "away on either side of the drum to and around a guide "pulley, each end of the rope is then led to a barrel placed "in between the guide pullies, it takes a half turn around "this barrel and then returns and is made fast. The barrel is "held between suitable guides passing across the stern" from one guide pulley to the other "and when the steering wheel "is turned, the barrel is caused to traverse in one or other "direction along its guides, and it revolves at the same time. "The barrel is fitted with an axis projecting up from it, and "this passes through a slot in the tiller secured on the rudder "head, or a swivelling fork may be connected to the top of "the barrel, and this may be made to embrace the tiller, a "prong passing on either side of it; thus, in either case, the "barrel as it traverses takes the tiller with it." By this means "the rudder and tiller can rise clear of the apparatus "without deranging it." "The barrel may, if desired, be "made with spur teeth upon it, and these may be made to "gear with rack teeth on the guide, or a case or frame may "be used instead of the barrel having two sheaves placed in "it, their flanges being so extended as to come in contact "*with the guide* plates, and so have a rolling motion similar

" to the barrel; a pin is fixed in the centre of this frame to " project through the tiller in the same way as the axis in the " barrel does in the arrangement first described."

[Printed, 4*d*. No Drawings.]

A.D. 1863, November 12.—N° 2820.

FORD, DAVID.—" Propelling boats and barges."

According to the Provisional Specification the invention " consists of a short buoy and vessel suitable for being " employed in connection with the stern of the said boats or " barges in place of the rudder," and provided with propelling apparatus. According to the description in the Final Specification, " short buoyant propelling vessels " are to be connected to barges, &c., and to be fitted with " screws, engines, " and steering apparatus " which " admits of being folded " close to the stern " of the small vessel. The object of this invention is to allow the propelling vessel to pass through locks at the same time as the barges, &c.

[Printed, 4*d*. No Drawings.]

A.D. 1863, November 14.—N° 2854.

LEWIS, JOHN.—Rudders.

" Wings or auxiliary rudders " are fitted on each side of the rudder. They are supported by arms from the rudder, so that they are held parallel to it (after the manner of a parallel ruler). These arms may be " rigid," but preferably they are jointed to the rudder and the wings, and chains attached to them may be led " up through or on the outside of the rudder " stock." The joints are by preference " formed by rings, " eyes, or hooks at the ends of chains or ropes passing up " through tubes or grooves in the rudder," " and the lower " ends of such holes or grooves determine the point at which " the rings stop, and on which the arms swing, or said chains " may pass beneath cross-pieces or hooks or through the " rudder, or up on the opposite side." The arms should be bevelled, and may have braces. " The wings when applied " to a rudder behind a propeller are to be of such a shape that " they cannot come in contact with the propeller blades, and " they may swing either downward or upward in closing." Chains may be fixed to support the wings. Chains " should

" lead to a device near the helmsman that can be operated " by his foot" so as to open and close the wings. The wings may fit in recesses in the rudder, and springs may be used to force the wings out. They may spread outwards from the rudder at bottom. In order to raise the wings, the arms " may be attached on vertical hinges so as to swing out " horizontally." It is stated that "the blade on the forward " side of the rudder when turned diagonally will be closed " down against the rudder itself by the action of the water " on its outer side, and that the other blade by the action of " the water against its inner side will be moved out from the " rudder" and serve to assist the steering.

[Printed, 8*d*. Drawing.]

A.D. 1863, November 18.—N° 2889.

ELDER, JOHN.—"Floating and other docks."

The floating dock has its pumping machinery arranged for driving propellers which may be used for steering, and the pumps "may be used for steering or propelling by a jet " action." The keels are in several pieces and "may be made " to turn on vertical axes" "or keel plates, or the boards may " be hinged to the bottom" and adjusted at any desired angle by chains.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, November 18.—N° 2895.

GRÆME, PATRICK ST. GEORGE.—(*Provisional protection only.*)—Ship-building.

An armour-plated turret ship is described. "The steering " of the vessel is effected by means of one or more rudders " placed in such positions as may be found most desirable for " the proper management of the vessel in water, and project- " ing below the bottom of the vessel." "The lower pivots " of the rudders are supported by means of a framing attached " to the bottom of the vessel, and the rudders are so formed " that the pivots upon which they turn are placed in a line " that passes through the centre of gravity of the rudder, or " nearly so, so that the pressure of the water upon them is " always nearly in equilibrio in whatever position they are " placed, and they are consequently worked with great ease."

[Printed, 4*d*. No Drawings.]

A.D. 1863, December 1.—N° 3013.

LUMLEY, HENRY.—Steering.

Improvements on No. 1150, A.D. 1862, in which a rudder is described having two separate portions, a "tail" and a "body," the two hinged together so that the tail bends over to the side to which the rudder is turned and presents a curved surface to water. Various modifications are given.

1. The "tail" has a tiller fixed to it which is slotted and works on a fixed pin projecting vertically downwards from a bar on the stern-post.

2. A similar arrangement is made, but the tiller is fixed at the middle of the "tail" and the projecting arm is double and circular to allow the "body" play. For the same end a portion of the "body" is cut away.

In either of the above, the pin may be on the "tail" and the slotted arm a fixture.

3. The keel may be extended to form a projection, on which is a pin working in a slot in the bottom of the "tail." The "body" may be pivotted on this projecting piece.

4. An arm on the "tail" may be jointed to an arm on the stern-post, and the arm on the "tail" may be fixed at any part thereof, the "body" being cut away, if needful, and the fixed arm being double and circular.

5. The "tail" may be worked by tiller chains independently of the "body."

6. The "tail" may be worked by chains, each chain being fixed to the "tail," passed through a slot in the "body," and secured to the hull on the opposite side to that on which it is attached to the "tail." Or the chain, instead of being fixed to the hull, may be led through the vessel to the deck, in which case also it may be passed through an eye-bolt on the "tail" instead of being fitted thereto and prevented from slipping through one way by a stop; both ends are then led on deck so that the chain may be drawn up by hauling on it in the opposite direction to that in which the stop prevents its action.

Any of the above rudders may be fitted with any appliance for locking it, the chains, guides, &c. being disconnected. The method preferred is a U-piece pivotted on the "body" and fitting over the "tail." This is held up by a chain when not in use.

[Printed, 10*d*. Drawing.]

A.D. 1863, December 2.—N° 3036.

LUNGLEY, CHARLES.—Ship-building.

A method of building armour-plated ships is described. The rudder is to be worked with "Z or double cranks actuated by "guides or rods or screws, the connections being made "through the ship by a water-tight trunk or tube." The rudder is placed "on a wide post as far from the aperture for "screws as possible" and "the connection for steering as near "the body of the rudder as possible."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, December 7.—N° 3073.

TILLING, GEORGE ROBERT, and PARK, JOHN.—"Steering "gear."

In the tiller there is a horizontal slot in which works a sliding block fitted with external flanges so that it can travel from end to end of the slot but is held therein. Within this block there is fitted an internally screwed nut which is free to rotate therein, but is prevented from moving out of the block by projections on its surface. This nut works on a screwed shaft which is rotated by gearing from the steering-wheel. As this rotates it carries the nut along it, and this carries the sliding block, which carries the tiller, sliding in the slot thereof as it goes. The drawings show two adaptations. In one the screwed shaft is rotated by gearing from two separate steering-wheels which have their axes parallel to the keel and are situated one on each side of the rudder-head. In the other a single wheel drives two screwed shafts which work each one side of a cross tiller or yoke. There may however be any number of tillers, and any number of screw shafts, &c.

[Printed, 10*d.* Drawing.]

A.D. 1863, December 8.—N° 3100.

WINANS, WILLIAM LOUIS, and WINANS, THOMAS.—"Adapt- "ing screw propellers for propelling ships or vessels."

By the invention screw propellers are applied to vessels of a spindle shape, like that described in the Specification of No. 1386, A.D. 1858, the shafts being supported on brackets. There may be one or more such propellers, and if two are at

one end, the rudder works between their shafts. If one propeller is placed near the stern, the rudder (which is then to be forward of the propeller) may be formed of "two plates one on "each side of the propeller shaft." If there be a propeller at each end of the vessel, both may be on the same shaft.

[Printed, 10*d*. Drawings.]

A.D. 1863, December 19.—N° 3208.

GISBORNE, FREDERIC NEWTON.—Signalling on board ship and elsewhere.

The invention relates to a method of signalling to the helmsman and for other purposes. There is also an indicating pointer on the bridge or elsewhere which is connected by gearing and endless bands with a wheel on the rudder-head, so that the position of the rudder may be shown in any required part of the ship. This is the only part of the invention which comes under any head connected with the present series.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, December 21.—N° 3222.

FITZWILLIAM, FREDERICK HERBERT.—(*Provisional protection only.*)—"Steering ships."

The following is the whole Provisional Specification :—"This "invention is designed to give increased steering power to ships "by adapting to the bow or stern or both, one or more screws "working at right angles to the keel of the ship, the said "screw or screws being driven by any suitable prime mover. "The following are examples of some of the means by which "this invention may be effected :—By adapting two screws, "one at the bow and one at the stern of the ship, and working "the same in conjunction, the ship could be moved sideways "or in a direction parallel to the keel; or by working one "screw backwards and the other forwards the ship could be "readily turned round in a very short time. By adapting "one screw only, placed at right angles to the keel of the "ship, the vessel could be readily steered, that is to say, "according to the direction in which the said screws were "worked the stern or bow of the ship could be moved either "to 'starboard' or 'port,' the power of steering being in pro-

" portion to the speed of the screw and the pitch of the same, " and thus the use of the ordinary rudder could be entirely " dispensed with."

[Printed, 4*d*. No Drawings.]

1864.

A.D. 1864, January 12.—N° 89.

WELCH, WILLIAM.—" Mechanical apparatus for propelling, " navigating, and governing ships."

A number of screw propellers of different shapes are figured in the drawings, and it appears that these are to be used for steering as well as propelling. No special description is given of the method of application. " In order that the apparatus " may be made conducive to the practical purposes of steer- " ing, governing," &c., there are " mechanical arrangements " at the driving axis of cylindrical or other figures " to which " the entire or sectional surfaces of revolution are attached " and secured, and by which means they are caused to revolve " by single or double action about one of the opposing line " of axes and thus producing by their combined operations " either a progressive, retrograde, stationary, or neutral " power." " The blades are thus adjusted at pleasure by " engine or other power to suit any required angle of grada- " tion, power, or position by the operation of governing rods " or arms made applicable by fittings on the line of shaft- " ing " " or by means of screw, slide lever, or other common " method, and acting also for regulating the stop or throttle " valves."

Reference is made to No. 2584, A.D. 1861.

[Printed, 1*s*. Drawings.]

A.D. 1864, January 18.—N° 137.

GRÆME, PATRICK ST. GEORGE, and FORBES, HUGH.—Propelling vessels.

This invention consists of improvements on No. 1691, A.D. *1863*. *In* the former Specification a force-pump consisting

of two cogged drums was described, which was to be used for steering and propelling vessels. In the present Specification several improvements in the construction of the drums are described, which have the object principally of avoiding friction. There are, however, no improvements on any parts of the apparatus employed specially for steering.

[Printed, 1*s*. Drawings.]

A.D. 1864, January 22.—N° 181.

JOHNSON, JOHN HENRY.—(*A communication from John Harris.*)—"Propelling and steering ships and vessels."

The principal object of the invention is to propel vessels by means of reciprocating paddles. Steering may also be effected by similar means. Various methods are figured and described for actuating the paddles. The paddles are formed with a long stem, on which is fixed a single broad blade. They are worked in various ways from a crank-shaft driven from any suitable motor. A pair of oscillating guide bars may be pivotted to the vessel's side. Between these a pin on the paddle-stem works the paddle, being lifted up and down by a crank, while another crank, by means of a connecting rod, gives a to-and-fro motion to the guides. A similar effect may be produced by lifting the paddle by an oscillating beam between vertical guides, which slide horizontally, and are drawn to and fro as above. Or the paddle-stem may be slotted, and work over a fixed guide bar, motion being given to it by a crank, so that the blade describes an arc through the water. Any combinations of these methods or modifications of them may be employed. The paddles may be made to feather, each blade being made in two parts pivotted on vertical spindles in a frame forming the edge of the paddle. By means of a lever arrangement, each half of the paddle is made to rotate a quarter of a circle at the moment of leaving the water, so as to present its edge for the return stroke.

Any of these devices can be used for steering, either by setting a pair of paddles one on each side of the stem, or by setting a single paddle so that it works across the line of the keel.

[Printed, 1*s*. Drawing.]

A.D. 1864, January 23.—N° 193.

MYERS, EDWARD, and GLOAG, HENRY DUNDAS.—(*Provisional protection only.*)—"Propelling and steering ships and "vessels."

Improvements in No. 1691, A.D. 1863. A peculiar description of toothed drum for hydro-propulsion is described. These drums are mounted in pairs in cases either horizontally or vertically in a suitable part of the vessel, and tubes are led from them to the bows and stern on both sides. Valves are fitted to these tubes in convenient positions, "so that the "influx of water to the case" "may be stopped either fore or "aft on either side," and the vessel may thus be steered or stopped.

[Printed, 10*d*. Drawing.]

A.D. 1864, February 19.—N° 429.

LEONARD, EDWARD JAMES. — Raising weights, steering ships, &c.

A nut on the end of the piston of a hydraulic or steam cylinder travels along a screwed shaft, which is thereby caused to revolve. On this shaft is a drum. No mention is made, except in the title, of any application of the invention to steering.

[Printed, 10*d*. Drawings.]

A.D. 1864, March 1.—N° 514.

HUMPHRYS, EDWARD. -"Machinery for propelling vessels "when twin screw propellers are employed."

The main shaft is at right angles to the propeller shafts, and gives motion to them by a pair of bevel wheels, each of which gears with a pair of bevel wheels running loosely on each propeller shaft. Each propeller shaft has also on it a pair of friction discs which can be brought in contact with similar discs on the wheels, so that the shaft can be driven in either direction according as either of the discs is in contact with the corresponding wheel. This is effected by moving the shaft a short way backwards or forwards by a lever. The thrust of the propeller itself, acting according to the direction in which it is working, serves to preserve contact, and the thrust *bearings* are "applied to the ends of the driving shaft."

Instead of having loose bevel wheels and discs, the bevel wheels may run with the shaft and be themselves thrown into and out of gear with the wheel on the driving shaft.

By means of this arrangement the action of the propellers can be varied, and the ship manœuvred, without stopping or reversing the engine.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1864, March 4.—N° 550.

HENRY, MICHAEL.—(*A communication from Louis Coignard.*)—Propelling vessels.

An "aquamotor" pump, or a force pump of other description, is supplied by two pipes opening one on each side of the keel, and with their orifices turned towards the bows. By the pump the water is driven into a casing surrounding it, and thence it passes to four tubes which lead, two on each side of the vessel, to a single orifice. The ends of the tubes are curved, so that though each pair delivers through a single orifice, one tube delivers in a forward, the other in a backward direction. To each pair is fitted a valve, which closes one of the tubes at a time, so that jets can be forced on both sides of the vessel forward and backward, to propel her ahead or astern, or a jet on one side can be thrown forward, and on the other backward, in order to turn her.

The rest of the Specification refers to improvements on the "aquamotor" pump described in No. 316, A.D. 1862, and No. 1324, A.D. 1863.

[Printed, 1*s.* Drawing.]

A.D. 1864, March 10.—N° 604.

BANKS, THOMAS.—(*A communication from George Fletcher Banks.*)—(*Provisional protection only.*)—"Steering ships "and vessels."

A pair of screws are mounted on shafts in a line with each other and at right angles to the keel. By their action the vessel is steered. Motion may be given the screws from the propelling engine, or by a separate engine. They may be employed instead of, or as auxiliary to, a rudder. One screw alone may be used, but two are preferred.

[Printed, 4*d.* No Drawings.]

A.D. 1864, April 2.—N° 824.

FITZMAURICE, The Honorable JAMES TERENCE.—(*Provisional protection only.*)—Rudders.

The invention consists in "constructing rudders with double "sides, each carried out at an angle with the line of the keel." No further description is given, but the drawing shows a rudder of which the horizontal section is triangular, the base of the triangle forming the after edge of the rudder.

[Printed, 6*d*. Drawing.]

A.D. 1864, May 18.—N° 1255.

GRÆME, PATRICK ST. GEORGE.—(*Provisional protection only.*)—Ship-building.

An armour-plated turret ship is described. "The steering "of the vessel is effected by means of one or more rudders "placed in such positions as may be found most desirable for "the proper management of the vessel in water, and project- "ing below the bottom of the vessel, by preference to a rather "less extent" than a certain portion of the hull, which is sunk low in the water. "The lower pivots of the rudders are "supported by means of a framing attached to the bottom of "the vessel, or they are placed in apertures left for that pur- "pose in the keel, which runs fore and aft of the sunken "portion of the hull, and the rudders are so formed that the "pivots upon which they turn are placed in a line that passes "through the centre of gravity of the rudder, or nearly so, "so that the pressure of the water upon them is always "nearly in equilibrio in whatever position they are placed."

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 1.—N° 1356.

TAYLOR, JACOB.—(*Provisional protection only.*)—"Pro "pellers for ships and vessels."

The propeller works entirely below water. It consis of a hollow drum with slots in its periphery, in each of whi is fitted a blade or float. At each end of the drum, eitl inside or outside, are plates with eccentric grooves, into wh pins on the blades take. These plates "are held station "*or have* revolving motion imparted to them as may

" required." By holding the plates in a proper position, the blades may be caused to project at either side of the drum, and be withdrawn at the other, so as to serve to propel the vessel in either direction. "If the eccentrics are turned " during the revolving motion of the drum, the vessel turns " round as on a centre either with or without the assistance of " the rudder."

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 3.—N° 1383.

CALVERT, WILLIAM. — (*Provisional protection only.*)— " Ships' propellers."

The propellers are "feathering submerged paddles," placed about midships. They are mounted "on an inclined spindle " which passes through or has its bearing in a boss at the " extremity of the crank shaft of the propelling engines, and " is further supported by a bracket arm keyed to the crank " shaft. The bossed ends of this shaft turn in bearings in the " side walls of the vessel. Keyed to the inner end of each " inclined spindle is a cogged wheel, which through an inter- " mediate pinion is connected with a bevil wheel mounted " loosely on the crank shaft. Coupled with this bevil wheel " is a worm wheel, into which gears a screw shaft that reaches " up to, say the deck of the vessel. This shaft receives axial " motion from gearing worked by hand." "By turning the " screw shaft of one of the paddles so that the position of that " paddle will be the reverse of the one on the opposite side," " the paddles will be caused to act in opposite ways, and " thereby without the aid of the rudder turn the vessel " quickly round."

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 9.—N° 1432.

OLDRIDGE, ROBERT.—Working rudders.

The invention consists "of applying and working two or " more sets of gear attached to one or more levers on the " rudder, and all worked by two or more helm-wheel barrels." " One of such improvements consists in attaching a crosshead " lever to the rudder head of the vessel, each end of the lever " being formed into a pulley block with two sheaves. A rope

" is attached to one arm of the lever, and then passes over a " pulley secured to the deck on the right of the said lever, " returning and passing over one of the sheaves in the pulley " block at the end of the lever, and again passing over a pulley " attached to the deck alongside the other pulley, and thence " to one of the barrels or drums of the helm wheel to which " it is attached. Another rope is secured to the same arm of " the lever, and then passes over a pulley secured to the deck " on the left of the said arm of the lever, returning and " passing over the other sheave in the pulley block at the end " of the lever, and again passing over a pulley attached to the " deck alongside the last-mentioned single pulley, and thence " to the other barrel or drum of the helm wheel to which it is " secured. Ropes are applied in like manner to the other arm " of the lever and to the barrels, and by these arrangements a " pull is obtained upon each end of the lever at one and the " same time in the direction in which the rudder is required " to be moved. The drums are connected and worked together " by cog wheels."

The ropes may be led to a steering-wheel at any part of the vessel. Instead of the ropes being made fast to the levers, they may be attached to an eye-bolt on deck, and the arrangement carried out with a " single purchase " only.

[Printed, 10*d*. Drawing.]

A.D. 1864, June 21.—N° 1551.

INGLEFIELD, Edward Augustus.—" Steering ships."

The invention consists in steering ships by a hydraulic cylinder which works the tiller, this cylinder being placed as low as possible in the ship, and worked by water admitted from the water in which the ship floats. The rudder may be worked directly from this cylinder, or a second cylinder may be driven from the first, and the rudder worked thereby. Chains or other means may be employed to transmit motion to the tiller. The first cylinder may be of such size that a single stroke is sufficient to put the tiller over, or it may be used to pump water continually into either end of the second cylinder until the desired result is attained. The ordinary apparatus is used for directing the movements of the engines.

[Printed, 8d. Drawing.]

A.D. 1864, June 22.—N° 1568.

SHAW, FREDERICK.—(*Provisional protection only.*)—"Pro-
" pulsion of steam ships."

"In the bilges of the vessels near the stern" are constructed "two tubes or cylinders, one on either side, of about " twelve feet in length, the four openings to curve downwards " through the bottom of the vessel in a slanting direction " towards the bows to admit the water, the opposite ends of " the cylinders to terminate in the run of the vessel's stern " under each quarter; in each of these tubes or cylinders" there works a screw propeller. The steering of a vessel on this plan is stated to be greatly improved "by reason of the " column of water being driven through the cylinder direct " upon the rudder; and in case of need a vessel can be steered " by means of the screws alone without the aid of a rudder, " and can be turned about at will."

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 5.—N° 1665.

AITCHISON, ROBERT KER.—"Steering vessels."

In an opening in the rudder (which is of the usual description) a screw is mounted on a short shaft connected to the propeller shaft by a universal coupling joint. This screw may be the main propeller, or an auxiliary. The screw has "two " vanes only," and is made of such size that it may fill up the opening in the rudder when it is not in use.

In the Provisional Specification an arrangement for automatically locking the rudder is described. A toothed segment on the tiller is driven by a pinion on the steering-wheel shaft; on the deck is a segment "furnished with moveable pins or pro-" jections working in radial slots" or vertically. These pins are actuated by a cam driven from the steering-wheel shaft in such a way that when the wheel is turned they are withdrawn, but when the wheel is steady they are projected and hold the tiller between them.

In the Final Specification this automatic movement is disclaimed, and a method of locking the wheel at the control of the steersman substituted. On the steering-wheel shaft is a wheel with slots on its periphery. A stop, actuated by a

treadle, can be pushed into any of the slots, so as to hold the wheel in any desired position.

[Printed, 10*d*. Drawing.]

A.D. 1864, July 7.—N° 1684.

SKINNER, HENRY EDWARD.—"Steering apparatus."

On the rudder is fixed a vertical screwed shaft, on which is a nut which slides in guides at the sides. This nut has attached to it endless chains which pass over barrels on the steering-wheel shaft and over pullies below. By this means the nut is caused to move vertically up and down in its guides, and thereby cause the screwed shaft to rotate and turn the rudder. Instead of the chains, the nut may be actuated by a rack and pinion.

[Printed, 8*d*. Drawing.]

A.D. 1864, August 3.—N° 1925.

JOHNSON, JOHN HENRY. — (*A communication from John Harris.*) — (*Provisional protection only.*)—"Apparatus for "propelling and steering ships," &c.

"This invention relates, firstly, to certain peculiar arrange- "ments of mechanism for giving a reciprocating horizontal "motion or an oscillating motion to a feathering paddle for "propelling or steering ships, such paddle being so con- "structed that the vanes will be closed when the paddle is "moving in one direction, and open when moving in the "contrary direction."

In one mode of carrying out the invention, a vertical frame is swung from a horizontal shaft. To the lower end of this frame vanes are attached, mounted on spindles. These vanes are connected together and capable of being moved or "feathered" by a rod. Two arms from two rocking shafts actuate the propeller. One, which is longer than the other, oscillates the frame, and the other strikes against tappets on the rod actuating the vanes, and "feathers" them as each stroke is completed. Instead of the two rocking shafts, a crank and an eccentric on the same shaft may be employed, or a horizontal vibrating beam. Various means for connecting together the vanes may be used. In another mode the frame *works along* horizontal guides, instead of swinging, and the

mechanism is modified accordingly. For steering, propellers as above described are so placed that they "reciprocate at " right angles to the keel."

[Printed, 4*d*. No Drawings.]

A.D. 1864, August 6.—N° 1965.

COUSINS, SIDNEY LESLIE.—(*Provisional protection only.*)—Constructing and propelling boats.

A boat is described which can also be used as a carriage on land. It can be propelled by oars, sails, &c., or a paddle wheel. "It may be steered on land by a wheel which acts as " a rudder when in the water."

[Printed, 4*d*. No Drawings.]

A.D. 1864, September 5.—N° 2168.

SYMONDS, THOMAS EDWARD.—Ship-building.

The following is the only part of the invention which has reference to the present series:—"In constructing rudders of " ships or vessels, upright, hollow, or solid bars of iron or " other material are used, framed together at the top and " bottom in such manner that the upright bars are parallel to " each other, but at a suitable distance one from the other. " These upright bars may be formed either of two or more sides " of lozenge, diamond, or other section; when of diamond shape " the angle formed by the two forward sides of each bar comes " opposite to the angle formed by the after sides of the bar next " before it, hence, when a rudder so constructed is put over, the " forward inclined surfaces of the bars will be more readily " brought in a line at right angles with the keel than the " central plane of the rudder, whilst the water acting on the " inclined surfaces of the bars will be led through or escape " between the openings, and thus prevent any void or vacuity " taking place on the side of the rudder opposite to that which " for the time is put over."

"Furthermore, in some cases it is preferred to form longi- " tudinal slots or openings at angles corresponding with the " angles of the bars previously described."

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1864, September 16.—N° 2265.

THORNTON, FRANCIS. — (*Provisional protection only.*)— "Propelling ships and vessels."

"The invention consists in placing and using screw or blade "propellers, so that one propeller shall act upon the water in "an opposite direction to the other." "To the shaft pro- "ceeding from the engine (usually adopted for screw propel- "lers), and at or near the end thereof," is "a toothed wheel "gearing with another wheel on another shaft secured to the "ship or vessel by framing, and placed at right angles to the "said shaft from the engine, this latter shaft having a suitable "number of propellers (four for instance) keyed thereon (say "two propellers on each side of the ship for instance), such "propellers being so secured that whilst one propeller is "perpendicular the other on the same side of the keel line of "the ship or vessel is horizontal. Instead of the propellers "being all keyed on one and the same shaft, two shafts may "be used, connected by gearing with the aforesaid shaft from "the engine. In this case each shaft may be moved inde- "pendently of the other, and, if desirable, each of the propeller "shafts may be worked from a separate engine. This double "shaft arrangement will facilitate the steering of the ship or "vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1864, September 28.—N° 2376.

FORBES, HORACE, and FORBES, HUGH.—"Steering ships."

The invention consists in forming a rudder like a fan, working on a horizontal shaft, and capable of being expanded into the water on either side as required. The leaves are made with catches, so that on the first being drawn out all the others follow in succession. The "fan rudder" can be placed either in the stern or the bows, and may be actuated in various ways. A method of working one at the bows and one at the stern is figured and described. In the stern apparatus, a drum on the steering wheel shaft gives motion by an endless band to a wheel mounted loosely on the spindle carrying the fan. By means of a clutch-box worked by a bell-crank lever which is actuated by a cam on the steering-wheel shaft, this wheel is *brought into* gear with the first or the last leaf of the series,

according to the direction in which the steering wheel is turned, and the fan is according "deployed" to one side or the other by the action of the wheel on its spindle. It may be arranged so that the whole fan is carried to one side or the other, or it may be fixed at its centre leaf, and only one half carried to each side.

In the apparatus to be placed in the bows, the rudder is contained in a box which is mounted on a vertical spindle, the spindle of the fan, being as before, horizontal. The box is carried round to starboard or port by a chain on a barrel on the steering wheel shaft, and on a wheel on the spindle of the box. The box is checked from going too far in either direction by means of a chain fixed to it and to the hull. As soon as the box has been brought into position, a cam on the steering-wheel shaft, by means of a lever, disengages the wheel on the spindle of the box, which then is allowed to run loose thereon. The leaves of the fan are then expanded by means of chains from a barrel on the steering-wheel shaft.

[Printed, 1*s.* 4*d.* Drawing.]

A.D. 1864, October 7.—N° 2478.

JACKSON, ADDIS.—(*Provisional protection only.*)—"Constructing and arming ships and other vessels."

An armour-plated ship with three keels is described. It "is propelled by two screws on the same screw shaft, each screw consisting, by preference, of two blades; they are placed a considerable distance apart from each other, and in the circle they move in they are so arranged as to be 90° in advance of each other. In addition to these two screw propellers on the same shaft, two other screw propellers are employed, arranged on each side of the middle keel, and working in the spaces between the middle and outer keel; these two propellers work in an opposite direction to the others. They also assist in steering the vessel, they being worked by separate engines. Two other propellers are also employed; they are placed about midway between midships and the bow of the vessel. The axis of these last-named propellers, instead of being parallel with the centre keel, are placed at an angle thereto, the one on each side thereof; this is for the purpose of assisting the turning of the ship, and also to assist in increasing the

" speed of the vessel." There is a "tower" on the upper deck, in which a look-out man is stationed, and " beneath this " tower the helmsman and steering wheel are stationed," so that the two men may readily communicate with each other.

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 18.—N° 2567.

PAUL, ALFRED, and PAUL, EDWIN.—(*Provisional protection only.*)—" Hydraulic rudder break."

This invention consists in the application of an hydraulic break to the rudder. The mode of construction may be varied, that preferred " being the rotary, which is as follows :—To " the tiller or arm which may be fitted to a rudder head (if " made of wrought iron) there are to be fitted or forged two " round arms, of any required size, branching off one from " either side of such tiller or arm, which arms are to be bent " or made to a regular curve of any required radius, the centre " of which will be the centre of the rudder head. The length " of such arms will be determined by the maximum motion " which the rudder to which it may be attached may have. " There is also to be a hollow circular cast-iron or other " metallic chamber, corresponding in radius to the arms " herein-before described; such chamber, when furnished " with proper stuffing boxes at the ends, and with a suitable " cock in the middle of it, having also the aforesaid arms " placed partially in it, with their arc the reverse way of the " chamber, is securely fixed to a strong foundation or sole " plate, which will have a set of metal blocks fitted to serve as " guides for the rudder head when such sole plate is fixed to " the deck. In close proximity, or attached to the said " chamber near to or above the said cork, there will be a " suitable (necessarily a small) tank which will be capable of " containing sufficient water to make up for (for any required " time) the loss of water which the said chamber may sustain " by leakage and evaporation."

[Printed, 4*d*. No Drawings.]

A.D. 1864, November 9.—N° 2779.

GALLOWAY, GEORGE BELL.—" Production of motive power."

Improvements on N° 2765, A.D. 1857, and N° 651, A.D. *1859.*

A pump is described which "compresses air and water." This "air and water" is discharged through pipes at the stern of a vessel for purposes of propulsion, or it is received into an "accumulator" where further pressure is obtained by springs, &c., and by forcing air in. "The water by which these "accumulators are filled will also in part be supplied by the "plunging and rolling of vessels at sea through valves in "pipes." Any number of these "accumulators" may be used, and from them it is said that the power for working the pumps is obtained. "The steering and reversing the position of "vessels without stopping the engines is to be effected by "having a pipe affixed in connection with the air and water "main delivery in exit pipes which will be placed on each "side at the keelson at the bottom of the ship or to the "accumulator or accumulators with which the air pumps will "be connected." The inventor says "the orifice of each pipe, "with valves fitted within them, will be caused to pass through "each side of the ship at the forward port communicating with "the sea, and also if required at or near the stern part, as by "these plans in connexion with or independent of two addi-"tional rudders, I affix at the terminus of the exit air and "water pipe, which I affix through the stern part near the "keel of the vessel. I shall supply additional and separate "independent steering and reversing power." The inventor also says :—"To obviate vibration, increase speed, and improve "the steering qualities of screw steamers and ships, I intend "to affix two of my forms of propellers upon one boss as well "as upon separate bosses, which propellers I have denomi-"nated a fish fin," as described in the above mentioned Specifications.

[Printed, 4*d*. No Drawings.]

A.D. 1864, November 10.—N° 2792.

RUTHVEN, MORRIS WEST.—"Steering apparatus."

The invention consists in utilising the force of the water which brings back the rudder into a central position after it has been put on. This force is caused to compress air, raise a weight, act on a spring, &c., and suitable mechanism is employed by which this force can be made to act on the rudder when it is required to be brought into use again. In the drawing, the end of the tiller is connected by a rod to the

middle of a lever, one end of which is pivotted at a fixed point, while the other end has a weight attached to it so that it raises it, or acts against a spring. By this means motion from the central line in either direction by the tiller causes the same movement in the lever.

[Printed, 6*d*. Drawing.]

A.D. 1864, December 21.—N° 3173.

BODMER, Louis Rudolph. — (*A communication from Charles Brown.*)—(*Provisional protection only.*)—Hydraulic apparatus.

The invention consists in using centrifugal pumps for working machinery of various kinds. A pump of special construction is described, which it is stated may be used for "steering "ships" in a manner not further explained.

No other part of the invention refers to the present series.

[Printed, 4*d*. No Drawings.]

1865.

A.D. 1865, January 5.—N° 29.

WATSON, William.—Propelling vessels.

A vessel is propelled by means of a paddle-wheel working in a chamber amidships. This chamber communicates with a tube running the length of the vessel and opening into the water at the bows and stern. Besides the terminal outlets, there are, close to both ends of the tube, lateral outlets. All these openings are fitted with sluices, by the use of which the direction of the jet may be regulated and the vessel steered. In the drawing it appears that the rudder is shipped so as to come across the middle of the stern outlet, but no allusion to this arrangement is made in the Specification.

[Printed, 10*d*. Drawing.]

A.D. 1865, January 14.—N° 118.

PAUL, Alfred, and PAUL, Edwin.—"Hydraulic steering "apparatus and rudder break."

Improvements on No. 2567, A.D. 1864.

The invention "consists in the application of hydraulic "principles to the working of ship's rudders" and for locking the rudder. It may be applied in various ways, that preferred being the "radial," which is thus described :—

"To the tiller fitted to a ship's rudder head there are to be "fitted or forged, as the case may be, two round arms of any "required size, branching off one from either side of such "tiller; the arms are to be made a regular curve of any "required radius, the centre of such curve being the centre "of the rudder head. The foregoing curved arms may be "made of wrought iron, cast iron, brass, or other suitable "material. The length of such arms will be determined "by the maximum motion which the rudder to which they "may be attached shall have. There is also to be a hollow "curved cast iron or other metallic chamber corresponding "in radius to the arms herein-before described. Such "chamber when furnished with proper stuffing boxes at the "ends, and with a suitable cock or valve, having also the "aforesaid arms placed partially in it with their arc the re-"verse way of the chamber, is securely fixed to a foundation "or sole plate and bolted to the deck. The hollow chamber "will be in two or more compartments communicating with "each other by means of internal passages. The aforesaid "cock or valve is to regulate the opening and closing such "passages. To act as a means of transmitting motion to the "rudder a suitable pump, either rotary or reciprocating, "direct acting or multiplied, must be attached, having "passages corresponding to the passages in the hollow "chamber."

[Printed, 4*d*. No Drawings.]

A.D. 1865, March 17.—N° 744.

STANDFIELD, JOHN. — (*Provisional protection only.*) — "Differential wheel gearing."

The invention is applicable, among other purposes, to steering, though no description is given of any special method of application.

The following is the general description given :—"The said "gear in its usual form consists of four spur wheels, which "I will call *a*, *b*, *c*, and *d*, and of a driving wheel or disc *e*,

" and the principal feature in my gear is that one of the spur " wheels is fixed and not revolving. The wheels *a*, *d*, and *e*, " are placed on the shaft to which the apparatus to be driven " is secured; *a*, is loose on the shaft, but secured to the " framing or pedestal; *d*, is keyed to the shaft, and *e*, " placed between *a* and *d*, revolves loose on the shaft. " Through a boss formed in the wheel or disc *e*, passes a short " arbor turning loosely in the boss; to one end of this arbor " is keyed the wheel *b*, gearing into *a*, and to the other end " of the arbor is keyed the wheel *c* gearing into *d*. Supposing " the wheels *a* and *c* to be of the same diameter, and twice as " large as the wheels *c* and *d*, it follows, that when the wheel " *e* has performed one revolution, the wheels *b* and *c* will " have passed once round the stationary wheel *a*, and wheel " *d* respectively, whilst the shaft with its appendages will " have performed three revolutions. By varying the sizes " of the wheels the proportion of speed between the driving " wheel *e* and the shaft can be varied at discretion according " to the object to be obtained."

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 20.—N° 1107.

CAUDWELL, HENRY.—" Ships of war and floating batteries," &c.

A vessel is steered by means of one or more paddle wheels " within the vessel and at right angles thereto, situate by " preference near the stem" (the Provisional Specification says, "near the stern" but the drawing agrees with the former description). These wheels "are below the water line, and " are enclosed in a case, except their lower floats, which dip " into a passage formed at right angles to the length of the " vessel, and open at both ends." They are driven by an engine "in the ordinary manner."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, April 25.—N° 1157.

ELDER, WILLIAM.—" Steering ships."

The object of the invention is to steer a vessel by power. Steam is preferred, but the motive force of water, compressed *air, &c. may* be used. A cylinder is fixed transversely to the

line of the keel and in it is a double acting piston with a rod on each side. Chains attached to the ends of the piston rods are led over pulleys to a drum on a shaft at right angles to the cylinder and fixed thereto. On the same shaft is a wheel with three grooves. In one of these grooves there is fitted a strap which can be tightened over the wheel by a treadle, so as to lock the rudder. In the other two grooves the two steering chains are fitted, one being led to each side of the tiller. The steering apparatus may be situated at any part of the ship, and the chains are led over suitable pulleys accordingly.

The steam, &c. is admitted on either side of the piston by a slide valve governed by a lever handle which turns a small crank shaft, "which by means of a pin is in contact with the "upper part of the slide valve." It is preferred "to let the "pin work at the centre of the valve, and to make the valve "base so broad that the part on one side balances the surplus "weight," which is effected by the stern pressure "on the "piece" "in which the pin works." The steam ports enter the cylinder at its lowest part, so that the water of condensation may be expelled without the necessity of "testing cocks."

A "compensating tiller" is also described. It is in the form of a triangle, of which the apex is fixed on the rudder-head, the whole being abaft the rudder-head. A jury tiller for steering by hand may be shipped at the forward corner of the triangular tiller. The chains are affixed to arms pivotted on the corners at the base of the triangle, these arms being attached to the corner of the triangle opposite the side from which the chain comes.

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1865, May 1.—N° 1215.

RUTHVEN, MORRIS WEST.—"Propelling vessels."

Water is driven by centrifugal pumps through tubes opening in the vessel's sides to propel her. "It is preferred that on "each side of the vessel there should be two tubular passages" leading to the bows and stern. The supply pipe from the pump meets each pair at the centre, and there is fixed a "ro-"tating sluice" which revolves on its centre in such a way as to close either of the outlet passages as required. This

change in the position of the "sluice" is effected by suitable apparatus. By this means the water can be driven out either at the bows or stern on either side, and the "management or "manœuvring and steering" effected.

[Printed, 1s. 2d. Drawings.]

A.D. 1865, May 20.—N° 1394.

MARTIN, JOHN.—(*Provisional protection only.*)—"Steer-"ing ships."

A second barrel is fitted on the steering-wheel shaft. On this chains are wound and carried to the tiller in the usual way except that intermediately of the barrel and tiller they are led over pulleys fitted in frames sliding in guides on the deck, one on each side. By means of a rack and pinion these frames can be moved to tighten the chains. This second set of gearing is to be used as auxiliary to, or as a substitute for, the usual set.

A drum is fixed on the steering-wheel shaft, and round it there passes a strap fixed on one side to a bolt on the deck, and on the other to a treadle, by which it can be tightened so as to lock the wheel. Or the strap may be fitted in the same way at both ends to levers.

Catches are fixed on the tiller, and on a support below it, which serve to hold the tiller when struck by a heavy sea. Below the tiller is a wedge-piece forced up by a spring, on the tiller is a similar fixed wedge-piece. Thus the tiller may be forced over the catch, but is prevented from returning.

A second shaft may be fitted below the steering-wheel shaft, and the two shafts connected by an endless chain over drums. Chains from a drum on the second shaft are led to the tiller, a similar apparatus to that above described being used to tighten them. Or, instead of this tightening apparatus a spur wheel is fixed on the second barrel of the steering-wheel shaft. On the outside of this spur wheel is geared a clutch with teeth fitting into the teeth of the spur wheel; to the clutch is attached a drum round which the steering chains are wound; to the clutch is fixed a lever; "then by turning the clutch round on "the spur wheel, it recedes from, or approaches the tiller, "thereby tightening or slackening the chains."

[Printed, 4d. No Drawings.]

A.D. 1865, May 30.—N° 1481.

JOPLING, JONATHAN.—"Propelling and steering vessels."

"This apparatus consists of a hollow vertical shaft, on which "is fixed a circular case, open in the centre to allow the water "to enter, and also open for about one-third more or less of "its circumference to allow the water to pass freely out. "Inside the hollow shaft rotates another vertical shaft, on "which is fixed a fan or fanner wheel having 2, 3, or more "arms, fans, or blades which when in motion, cause the water "to pass freely out of the case. For turning the vessel, or "going astern, or altering the direction of the vessel's motion, "this will be accomplished by causing the hollow shaft with "the case to revolve or turn until the opening in its circum-"ference allows the water to escape in the direction desired; "it will thus not be necessary to reverse the engines, nor is "any other rudder required. The apparatus may be fixed "near the stern post, and the shafts pass up where the rudder "trunk usually is. The fan wheel shaft may be driven from "above or below the circular case, as may be desired."

[Printed, 10*d*. Drawings.]

A.D. 1865, May 31.—N° 1496.

BROWN, WILLIAM AUGUSTUS. — (*Provisional protection only.*)—"Steering ships."

The entire Provisional Specification runs as follows:—"The "object and intention of this invention is to so construct "steering machinery that the orders or commands of the "captain of a ship can be more readily and certainly obeyed "than heretofore, and also to simplify the construction of "such machinery. The following is an example of the means "by which I propose to accomplish the above objects. Sup-"pose the steering-wheel to be situated on a stage amidships, "I fix on the axis of the said wheel a spur wheel which gears "into another spur wheel mounted immediately under the "former spur wheel; the bottom wheel aforesaid gears into a "toothed rack mounted horizontally in suitable guides; to "each end of this rack I connect one end of a chain which "passes over pullies suitably placed along the gunwale of a "ship, the other end of the said chains are connected to a long "arm or lever fixed on the head of the rudder-post. The

" outer end of this lever I propose if desirable to connect with " a toothed quadrant to neutralise or lessen the tremulous or " vibratory motion of the rudder. I would also remark that " although the mechanism above described in connection with " the steering wheel is single action, I do not intend to limit " myself to the use of two spur and one rack aforesaid, but " propose as a further security to use a second steering-wheel " fixed on the opposite end of the axis of the former wheel, " and to employ spur wheels and a rack similar to those " already described, thus forming a double-action steering- " wheel which can be used by a man at each wheel, or if " desired one of the said wheels may be disconnected and the " single action only be brought into use. I also propose to " adapt a stop to the rack bar aforesaid to hold the rudder in " a fixed position when it is required to back the ship."

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 9.—N° 1577.

HARFIELD, WILLIAM HORATIO.—"Steering ships."

The steering-wheel shaft passes directly over the centre of the rudder post, and has on it a pinion which gears with other pinions, " one on each side of it; these latter pinions being " fixed on two screws, the one right and the other left-handed." On the screws are nuts which traverse along the screws in contrary directions, " the blocks being guided and steadied by " the axis of the steering wheel, each block having a half- " round groove on its edge and fitting against the axis. The " nut and traversing block may be made together in one piece, " but this is not so convenient. On the rudder post is a cross- " head, it is forked at the ends, and in each fork is a slide or " brass capable of moving radially to and from the centre of " the rudder post. At the outer end of each sliding block a " pin is fixed projecting downwards and entering a hole formed " to fit it in the slide or brass working in the fork of the rudder " cross-head beneath."

The nuts are made of cast iron with a passage through them for the screwed shaft, the thread of the nut being formed by placing the nut on the screw and running in " white metal " or brass."

[*Printed*, 8*d*. Drawing.]

A.D. 1865, July 1.—N° 1752.

CALVERT, JOHN.—"Propelling ships and other vessels."

Two tubes are constructed in the vessel, running from stem to stern below the water-line. They "are open at both ends, "and in the interior of each is placed an archimedean screw "mounted on a suitable shaft," "caused to revolve by means "of gearing actuated by any of the ordinary and known ma-"chinery." By these arrangements a stream of water is drawn in at the bows and expelled at the stern. "The screws "can be operated either together or singly, and can also be "reversed as may be desired, and so that the ship or vessel "can be steered as well as propelled by means thereof."

[Printed, 4*d*. No Drawings.]

A.D. 1865, July 24.—N° 1919.

CROFT, JOHN MCGREGOR.—Rudders.

The inventor says :—

"To an ordinary rudder I apply a diagonally curved or "oblique blade or blades of metal or wood, which are attached "at either or both sides of the shoulder of the rudder at or "about the water line. The blades stand out obliquely curved "at the upper and after part like wings. The remaining "portion of the blades is in contact with either or both sur-"faces of the rudder. A rudder may be built up according "to this design."

Without the help of a drawing, it is difficult to describe the shape of these "wings." The plan view of them shows the outer edge of the wing springing from the forward edge of the rudder and passing directly backwards at an acute angle to the side. This outer edge is horizontal but the whole of the wing does not lie in the same horizontal plane, it curves downward till it meets the side of the rudder to which it is bolted.

The blades may be of any suitable material and fixed at any part of the rudder. They may be strengthened by transverse bars. They may be fitted to the rudder by being slid down in suitable slots and afterwards secured.

[Printed, 8*d*. Drawing.]

A.D. 1865, September 22.—N° 2418.

ATKIN, ROBERT.—"Propelling vessels."

The improvements are intended principally to supply auxiliary power to sailing vessels.

The inventor applies "to the sides of the vessels (at that "part where paddle wheels are usually placed) screw pro- "pellers, which are set in bearings in frames hinged or jointed "to the sides of the vessel, and capable of being raised or "lowered from the bulwarks by means of lifting or suspending "chains worked by a windlass or other equivalent gear. The "frames are also held by supporting chains from the bulwarks, "the lifting chains being hung from the davits. The frames "contain screws or propellers driven by endless chains, and "whelped bosses on the shafts; or the shafts may be actuated "by toothed gearing, in either case worked by steam power, "the chains or shafts passing through the sides of the vessel. "One or more screws may be placed on each side of the vessel, "and by reversing the engine on one side and going ahead "on the other, the vessel may be turned round in a space "little more than her own length." The engines used are small engines which may be applied for general use on ship-board as well as for propulsion.

[Printed, 8*d*. Drawing.]

A.D. 1865, October 5.—N° 2563.

FRASER, Robert William.—"Improvements in the pro- pelling and steering of steam ships or other vessels, and in "the machinery or apparatus employed therefor."

One or more flat plates are hinged to a cross-head "attached "by a reciprocating driving shaft (passing out through a "stuffing box by preference in the stern of the vessel) to the "piston rod of the motive power engine." This plate is driven outwards for the propelling stroke, and feathered for the return stroke. The feathering is accomplished by rods attached to the propeller. The rods may either pass through the shaft, or be distinct from it. Two methods are described for directing the propellers so as to steer the vessel. The first is thus described:—The inner end of the feathering rod at the end of the stroke strikes against a stop. Its motion is checked, and "consequently it either pushes up to a vertical, or pulls "down to a horizontal position, the propeller to which it is "hinged." A friction clutch may be brought down on the rod, so as to hold it in a horizontal position. By its aid the *rod may be made* to keep the propeller vertical during the *return stroke*, and so back the vessel. By driving the pro-

pellers in different directions at the same time the vessel is steered. In the second method, the cylinder has three pistons; "the two additional pistons are attached to each other at an "invariable distance by two rods which pass through the "main or driving piston. One or other of these pistons must "always be from the main piston a distance equal exactly to "the space moved over by the crank attached to the propeller." The "rods uniting the pistons pass through stuffing boxes on "the lid and are attached to a cross-head, and thence pass to "cranks which they drive." The action of the apparatus is thus explained:—

"Let it be supposed that an outward stroke has been made "with the propeller in a vertical position; at the termination "of this stroke the lowest piston, with the feathering rod "attached to it, is at the end of the cylinder, and the steam "is admitted beneath the lowest piston; it immediately moves "through the space between it and the main piston, pulling "down the propeller to a horizontal position, and as soon as "it touches the main piston it drives it to the other end of "the cylinder; this stroke being completed, the upper piston "arrives at the opposite end of the cylinder, having a similar "space between it and the main piston; on the admission of "steam as before, it moves forward and pushes up the pro-"peller, and then drives the main piston to the other end for "the propelling stroke; the opposite action for backing or "steering is obtained by a simple reversing mechanical con-"trivance, and to obviate any concussion when the pistons "come in contact in the cylinder, there are valves in each of "the two additional pistons which admit a small portion of "steam between their surfaces."

[Printed, 1*s*. Drawing.]

A.D. 1865, November 7.—N° 2864.

VIEHOFF, Charles Jullien, and MATTHIESSEN, James Adolphe.—(*Provisional protection only.*)—"Steering indi-"cators and tell-tales."

The apparatus is stated to be applicable either for giving orders to the steersman, or for showing the position of the rudder. It is only in its second modification that it relates to this series.

A dial face is "fitted but not fixed on a shaft free to revolve, "and carrying a pointer or hand so disposed as to work before "or travel over the dial. For day use the dial is held to its "support or framing by a pin" or otherwise. The shaft is driven by gearing from the steering apparatus. "For night "use the pin or fastener is removed and the dial is connected "with the pointer by means of an axis, and maintained in place "preferably by a pin or forelock sliding on the fore part of "the pointer through a hole or slot in the axis. A lamp is "connected with the axis and revolves, it is restored to its "vertical position by a weight. The door provided with glass, "or with a lens, is at the fore side. An opening, preferably "similar in shape to a pointer, is made in the dial to show" "the light of the lamp." The light from this opening "forms "as it were an illuminated pointer." The lamp is "counter-"balanced by a weight fixed to the large dial." "The dial is "perforated to make it lighter and allow the wind to blow "through."

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 7.—N° 2865.

ESPLEN, WILLIAM, and CLARKE, JAMES. — "Steering "gear."

The improvements relate to steering by hydraulic power.

The piston of a hydraulic cylinder receives motion directly from the steering-wheel, which is formed with a female screw in its axis fitting on a male screw on a prolongation of the piston rod. On each side of the tiller end is fixed a hydraulic cylinder, and the rams from the two cylinders are fixed to a short central piece a pin on which slides in a slot in the tiller. Each end of the main cylinder is connected by a pipe with one of these secondary cylinders and as the fluid is driven by the piston through one or the other of these connecting pipes, it is forced into one of the steering cylinders, and drawn out of the other so as to work the tiller.

In a modification, the screwed shaft may be fixed to the steering-wheel, and may actuate a cross-head from which a rod is driven which connects the rams of two opposite hydraulic cylinders with their axes in the same line. Each of these cylinders is connected with a steering cylinder as above, but

instead of being placed one on each side of the tiller, they are connected one to each end of a yoke or cross-head on the rudder-head.

A "safety ram valve" may be fixed on each cylinder. It consists of a small ram in a hydraulic cylinder, the head of which is pressed down by a spring regulated by a set screw. To give "a slight elasticity to the rudder" "common hollow "india-rubber air balls" may be placed in the fluid.

The steering apparatus may be placed on the bridge, or in any other convenient part of the ship.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, November 15.—N° 2938.

ATHERTON, CHARLES, and RENTON, AMHERST HAWKER.—(*Provisional protection only.*)—"Steering ships."

This is effected by "currents of water derived from the "passage of the vessel through the water." There are "one "or more tubes or channels extending from the bow to the "stern" "or partially so." Through these the water is to be allowed to flow "entering at the forward end or ends, and "escaping at the after end or ends" through branch tubes "in each side of the ship." There are valves to direct the flow of water. It is stated that these arrangements supersede the use of the rudder.

[Printed, 4*d.* No Drawings.]

A.D. 1865, November 20.—N° 2982.

WEEMS, JOHN.—"Construction of ships."

One object stated to be attained by this invention is that of "enabling vessels to turn within a smaller circle more "speedily." The invention however does not refer to any method of steering or manœuvring a vessel, and therefore scarcely comes within the scope of this series. It consists in forming on each side of the hull air-tight chambers which can be filled with air or water, so as to lighten the ship or the contrary. By filling the chamber on one side with air, and the corresponding one on the opposite side with water, the vessel is canted over on one side. This, it is said "will be found to "assist in moving her round within a smaller circle, and more "speedily than when on an even keel."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1865, December 9.—N° 3171.

CLARK, SAMUEL.—"Steering apparatus."

A pair of balanced rudders are mounted one on each side of the stern-post or the screw, in screw steamers. The spindles of the rudder are "stepped in bearings carried by the dead "wood." The top of each rudder spindle is fitted at its upper end with an arm which passes through a link on a rod which slides horizontally in bearings. On the steering-wheel shaft are two worms, one right and one left-handed, each of which gears into a horizontal segment rack on a vertical shaft carrying also a segment rack gearing into a straight rack on one of the sliding rods, or a segment attached by cross chains to the sliding rod.

[Printed, 10*d*. Drawing.]

A.D. 1865, December 13.—N° 3222.

BROOKES, WILLIAM. — (*A communication from Joseph Denis Farcot, Jean Joseph Léon Farcot, Michel Basile Abel Farcot, Joseph Etienne Eloi Chateau, and Emmanuel Denis Farcot.*)— "Improvements in turbines for obtaining motive "power, applicable also to raising and forcing fluids, and to "propelling ships or vessels."

The object of the invention is to give as great velocity as possible to the wheel, while "only a feeble movement is "imparted to the fluid." A shield "conducts the fluid from "the inlet pipe to the floats without permitting it to receive "any rotary movement from the disc. A second shield acts "in like manner to prevent the waste in the delivery chamber "from participating in the rotation of the disc." The delivery chamber "progressively increases in proportion to the "amount of delivery to be effected." The delivery tube is conical. The floats are made of "a disc of sheet metal cut "radially and enclosed between two plates." There is also "a new arrangement of the stuffing boxes for the axis pro-"vided with rings, forming a hydraulic joint by means of a "small passage communicating with the delivery chamber. "Two little spaces formed by small longitudinal ribs enclosing "a spongy substance constitute a filter, which arrests sand "*or other foreign* substances which might arrive at the small

" passage from the delivery conduit, and only allows the " water to pass into the upper surface of the stuffing box."

A turbine wheel for the propulsion of ships is thus described :—

"The delivery tube is connected by a receiver, which has " tubes capable of being each closed at will to allow of the " direction of propulsion being varied. If a tube opening " at the stern is open the ship moves forward. In order to " move backwards this tube is closed and others inclining " forwards are opened. To turn round or tack about lateral " conduits are opened corresponding with the direction re- " quired. These principles are applicable to screw propellers " by the transformation of their blades into tubes curved " (enroulés) following a curve corresponding to the speed of " the ship, and presenting only their heads as surfaces of " resistance, into which the water enters as in the turbines " with floats. The direction of motion is changed by causing " each of the tubes to make half a turn, at the same time " reversing the direction of rotation."

[Printed, 10*d*. Drawing.]

A.D. 1865, December 26.—N° 3341.

VIEHOFF, CHARLES JULLIEN, and MATTHIESSEN, JAMES ADOLPHE.—(*Provisional protection only.*)—"Steering indi- " cators and tell-tales."

"A disc in which is an opening of or nearly of the shape " of a pointer is mounted on a shaft. This opening is fitted " with a transparent or semi-transparent material. The disc " works in a ring on which are numbers or divisions made of " or on or over a transparent or semi-transparent material ; " or the pointer numbers or divisions may be of or on colored " surfaces." When the apparatus is used as a tell-tale the dial is driven by gearing from the steering apparatus. "A " pointer is connected with the gearing, and travels over a " repeating dial" to shew the position of the rudder. At night the instrument is illuminated. A dial may be used "fitted but " not fixed on a shaft carrying a pointer which travels round " the dial." "For day use the dial is fastened to its sup- " port." The shaft is driven by the steering apparatus. " The dial has in it a slot or opening resembling a pointer.

" For night use the dial is disconnected from its support and " connected with the pointer and axis so as to move therewith. " The dial is illuminated preferably by a lamp revolving with " the axis but restored to a vertical position by a weight. " The door, provided with glass or with a lens, is at the fore " side. The opening in the dial serves as an illuminated " pointer and shows the position of the rudder." " The lamp " may be counterbalanced by a weight fixed to the large " dial. A suitably placed second dial and pointer repeat the " position of the other. The dials and discs may be per- " forated to render them lighter and afford passage for the " wind."

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 29.—N° 3367.

NAPIER, JAMES ROBERT, and RANKINE, JOHN MACQUORN.—Rudders.

The inventors say :—

" Our invention consists in making the rudder of a vessel " propelled by the screw of such a shape that in the midship " position of the rudder its surfaces shall at each point of the " forward edge stand in a direction tangential or nearly " tangential to the streams of water driven obliquely aft by " by the screw, and that in the same position of the rudder " its surface at each point of the after edge shall stand in a " fore-and-aft direction or nearly so, the said surface being " fair and continuous between those edges. The object of " the improvement in the shape of the rudder is to increase " the efficiency of the screw for propelling and of the rudder " for steering. We prefer the balanced rudder, but our " invention may be applied to the common rudder also, in " which case the rudder port is to be so shaped that its side " surfaces shall form continuations of the side surfaces of the " rudder in its midship position."

To give any further description without the aid of diagrams would be difficult. Full directions for planning out the rudder are given.

[Printed, 10*d*. Drawing.]

1866.

A.D. 1866, January 1.—N° 7.

ASHDOWN, JOHN. — (*A communication from George Banks.*)—(*Provisional protection only.*)—"Manœuvring and "steering ships."

A screw propeller for steering purposes is mounted with its axis at right angles to the keel at the stern, either in a cylindrical casing or in a frame attached to the stern. It is revolved either by gearing from the main propeller shaft or independently. In the former case the gearing must be such as to be readily connected and disconnected, such as a bevel wheel or the propeller shaft driving one of two opposite bevel wheels from which motion in either direction is given to the steering screw. The steering screw may be used instead of or as an auxiliary to the ordinary rudder.

[Printed, 4*d*. No Drawings.]

A.D. 1866, January 27.—N° 270.

HOWDEN, JAMES.—"Steering, manœuvring, and propelling "ships or vessels."

A tube is fixed across the vessel near the bows or stern, or one at both places. In it a screw propeller works so as to draw the water in at one side and eject it on the other. The propeller is worked by a shaft gearing with wheels on the propeller shaft. The screw preferred is made "of properly "constructed blades on two conical centre pieces placed back "to back on the same shaft, the wheels for working the screw "being placed in a fixed covered circular case between." It thus really forms two separate propellers. The engines may be connected direct to the screw shaft. For this purpose a water-tight box is fitted to the tube open at one side to the ship. Through this opening a connecting rod passes. The shaft passes through this box, and the propellers are placed one on each side of it. Space is left outside the box for the passage of water along the tube. A centrifugal pump may be employed to draw in water at one side, and eject at the other, along tubes like the above. Or water may be drawn along a tube from another part of the vessel and ejected through cross

tubes, its action being controlled by valves in the cross tubes. The tube may be arranged lengthwise of the ship. It branches out "at some distance from either end of the vessel," one branch passing to each side. Valves to close either branch enable the ship to be steered. There may be one or more propelling apparatus, and the tube need not run the whole length of the vessel.

[Printed, 10*d*. Drawing.]

A.D. 1866, February 1.—N° 321.

MURRAY, ANDREW.—"Steering apparatus."

A pair of steam cylinders drives a crank shaft and this drives a shaft at right angles to it which carries on it pinions engaging in two horizontal and parallel racks. Cross-heads fixed across these racks have connected to them the ends of two piston rods fixed one on each side of the piston of a hydraulic cylinder situated between the racks. Tubes lead from the cylinder to a second hydraulic cylinder which is made to work the rudder in any suitable way, as by a "block sliding in a "groove in a cap or cross head fixed on the end of the piston "rod." The method of working the rudder as described in the Specification of No. 1037, A.D. 1859 is preferred.

In a modification the crank shaft has on it a pinion gearing with a cog-wheel in the axle of which is a female screw. This works on a male screw on a prolongation of the piston rod of the hydraulic cylinder and thus drives the piston.

Other modifications may also be employed; thus the piston may be fixed, and the cylinder moveable.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, February 5.—N° 354.

SPINK, DAVID.—"Propelling and steering vessels."

The vessel is propelled by the reaction of a jet of water driven out at the stern. This jet is produced by the pressure of steam acting on the surface of water in a chamber communicating with the outlet pipe at the stern and an inlet pipe at the bows. This chamber is fitted with valves so that while the steam is admitted to the chamber, the connection with the inlet pipe is cut off. The steam is turned off at intervals *by means of* a suitable engine, the steam in the chamber is

condensed, the valve from the inlet pipe opens, and water enters. The jet is thus intermittent. The ends of the tubes are fitted with valves which only permit the water to pass in the required direction, i.e., from stem to stern. Two of these apparatus may be used.

For steering a "movable nozzle" may be fitted to the discharge pipe, and this can be turned in any required direction by mechanism to be operated by a steering-wheel.

[Printed, 10*d*. Drawing.]

A.D. 1866, February 9.—N° 405.

DAVIS, GEORGE DANIEL.—"Machinery for working rudders."

The inventor says:—"The object of these improvements "is to give greater security and protection to the screw shaft "and nut, and also to enable the rudder to work steady and "easy. To effect this I use screw and chain in conjunction "as hereafter described, and also construct frames or bearings "suitable to receive rollers, blocks, or sheaves, which are "supported on perpendicular or horizontal spindles, and on "these frames or bearings are placed or fixed an iron-plate, "slide, or slotway rods, or guard irons, which are for the "steadying of a nut that works or travels thereon, and also "for the security and protection of the screw. I do not con-"fine myself to any particular form of slide or guard irons, as "various shapes may be used for the same purpose. The "nut is propelled along the slide, slotway, or guard irons by "a rotary movement of the screw shaft or spindle which "passes through the nut, and the end connected to an ordi-"nary steering wheel which is worked in the usual manner "to give the desired motion. To the nut is connected chain "or rope; these chains or ropes are passed round the rollers, "blocks, or sheaves above alluded to, and then connected to "a wheel segment or lever fixed on the rudder head, and the "desired motion conveyed thereto by the nut travelling along "the slide, slotway, or guard irons, as above mentioned; an "iron plate or lever may also be fixed to the nut, and the "chain or ropes connected thereto and worked in a similar "manner as described."

[Printed, 8*d*. Drawing.]

A.D. 1866, February 16.—N° 502.

LINNINGTON, Adolphus Henry.—(*A communication from Peter Dinzey.*)—(*Provisional protection only.*)—"Rudders "and steering apparatus."

Below the bottom of the rudder is a segmental rack supported in a frame on the stern post. A rod passes freely down a hole along the length of the rudder and rests on the rack. "Around the lower end of this rod there are three or more "cogs cut, which fit exactly into the cogs on the arc, and the "shoulder formed by the cogs so cut" "acts as a support "for the rod on the arc." The rod passes through a hole in the tiller, and has a wheel on it which is rotated by a rope from a wheel on the steering-wheel shaft. The rudder is turned by the cogs on the rod working along the rack. The rudder is hung by a rod passing through gudgeons on the rudder and on the stern-post, and screwing into the lowest gudgeon on the stern-post. The gudgeons are distant from each other the length of the radius of the arc. "The after "part of the stern-post and the fore part of the rudder are "both grooved so as to allow the rudder to be drawn upward "until the last gudgeon on the rudder touches the next "gudgeon on the stern-post."

The usual tiller rope may be used as well as the above apparatus.

"The rudder is also made in two separate halves from the "rudder-head inclusive to the bottom, the two grooves, the "one for the rod through the rudder-head, and the one for "the cog rod being first made and adjusted, and then the two "halves screwed together." Instead of being underneath the rudder, the segment rack may be fixed "just clear of the "shoulder of the rudder so that the rod descending obliquely "from the rudder-head on deck would be made to play along "the arc by means of the cogs, and would then descend into "the hole of the rudder." Or it may be fixed at any point of the rudder, and "in that case the rudder will work within "the radii of the arc, the part of the rudder above the arc "being made to project out abaft of the arc sufficiently to "allow the rod to work on the after part of the arc."

The invention may be applied to "the double rudder" with *one part hinged* to the other. "The framework under the

" rudder has two arcs" "one within the other; the one " within describes the course of the first division of the " rudder, and is without cogs, but at a certain angle with " the stern-post, say, thirty-five degrees, has blocks or " shoulders rising a few inches high, which stop the first " half of the rudder at that point on either side. Just on the " after part of the first segment the second half of the rudder " is hinged." "The second segment, which has the cogs, " describes the course of the whole rudder," "until the first " half is stopped by the blocks." "The outer segment from " that point on either side has its centre at the block" "and " continues with a shorter curve until the second half is " brought around to an angle of fifty-five degrees."

[Printed, *4d.* No Drawings.]

A.D. 1866, March 1.—N° 626.

SKINNER, JAMES.—"Steering apparatus."

On the end of the tiller is pivotted a sliding block which moves in guides on a metal plate. These guides are a portion of an arc or of such other shape that when the plate is given a rectilinear motion the slider is carried to one side or the other. This rectilinear motion is effected by means of a nut on a screwed shaft turned by a steering wheel, by a rack and pinion, by hydraulic power or otherwise. "A crosshead or " disc may be used instead of the tiller, and a roller or " rollers" instead of the slider. "A link or links so placed " as to radiate through the arc described by the guides may " be used instead of the guides." The slides may have " india-rubber or spring buffers" to lessen the shock of " concussions.

[Printed, *8d.* Drawing.]

A.D. 1866, March 2.—N° 638.

CLARK, WILLIAM.—(*A communication from David Fernando Masnata.*)—"Steam vessels."

A vessel is described which consists of a drum with a " gallery" or framework supported thereon by being attached to the shaft of the drum. The drum is revolved by engines within it, and the frame remains horizontal. The vessel is steered by means of two rudders attached below the frame, and situated one at each end, on the same side of the frame.

"These rudders may be so arranged that they can be lowered "into the water as and when required for changing the course "of the ship, and again raised when no longer required."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, March 14.—N° 766.

MERRIAM, Scovil Sturgis. — "Submarine and torpedo "boat."

A boat of this sort is described. It is steered by altering the direction of the propeller shaft, which is mounted in a swinging frame at the stern, its shaft being fitted with a universal joint. Chains attached to this frame are led inboard through suitable tubes to a steering-wheel so placed that the steersman can look out through a small turret into which his head and shoulders pass as he sits at the wheel. There are also two rudders set in a horizontal plane for use in descending and ascending. These are set one at each side near the stern on the ends of a transverse horizontal shaft. This is driven by a shaft at right angles to the first, and extending along the vessel to the central chamber where it is worked by a lever handle.

[Printed, 1*s.* Drawing.]

A.D. 1866, April 5.—N° 978.

VIEHOFF, Charles Jullien, and MATTHIESSEN, James Adolphe.—"Steering indicators and tell-tales."

In this Specification a method of signalling to the steersman is described. There is also an apparatus to be connected to the rudder to show its position. A dial plate is divided across its centre by a line, and on each side of this is a segmental opening at either of which an index is caused to appear to represent the position of the rudder; the central line representing the line of the keel. These indexes are segmental plates of ground glass divided radially by dark spaces, and as each index exposes more or less of its surface at the corresponding opening, the number of light and dark spaces serves to denote the position of the rudder. The dial may be placed in any convenient part of the ship, and the indexes may receive motion in any suitable way from the rudder shaft or tiller; preferably by means of a *cam on a shaft* concentric with the dial-plate which brings into *action one* or other of a pair of levers each actuating one of

the indexes. A repeating instrument may also be placed near the steersman or elsewhere, constructed like the above, but without the central line. In it both the indexes are formed in one circular plate. It is worked by gearing from the main apparatus. The apparatus is illuminated at night.

[Printed, 1*s*. Drawing.]

A.D. 1866, May 8.—N° 1311.

JOHNSON, JOHN HENRY. —(*A communication from Jean Pierre Victor Le Rouge.*)—"Propelling and steering ships."

The screw is mounted in such a manner that it can be turned about to any angle to steer as well as propel the vessel. For this purpose it is mounted on a swinging frame on a vertical shaft by which the frame and screw can be turned about through the action of a suitable steering apparatus. To enable the motion of the propeller shaft to be communicated to the screw when in any position, it is transmitted through three bevel wheels of which the intermediate one runs loose on the central shaft, while the other two are keyed on the propeller shaft and the short shaft of the screw respectively. Instead of this arrangement there may be a "hemispherical toothed wheel" on the main-shaft and on the screw shaft, the two gearing directly into each other.

[Printed, 8*d*. Drawing.]

A.D. 1866, May 18.—N° 1415.

GRIFFITHS, ROBERT, and RIGG, ARTHUR, junior. —(*Provisional protection only.*)—"Improvements in apparatus for "propelling and steering steam vessels."

Improvements upon No. 874, A.D. 1864. Instead of a number of fixed curved blades fixed behind the propeller, one or more is used, capable of being adjusted at different angles. Two blades, either curved or flat, may be placed one above and one below the axis of the propeller. They are to be placed "radially or nearly so." By suitable shafts their angles may be altered. If only one or two fixed blades are employed, "the stern or rudder post may be so shaped as to act upon "the column of water projected backwards," in the same way as the arrangement of blades. The inventors say "apparatus "arranged in this manner will also aid in steering the vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 28.—N° 1486.

HENWOOD, CHARLES FREDERIC. — (*Provisional protection only.*)—Rudders.

The following is the entire Provisional Specification :— "This invention has for its object improvements in ships' "rudders and parts connected therewith. When balanced "rudders are employed, or rudders which in order to facilitate "the steering are made to project in front of as well as behind "the rudder spindle, difficulty is experienced in obtaining "sufficient strength; such rudders are usually of large size "and supported with only two bearings, the upper or main "bearing in the counter or hull of the vessel, and the lower "bearing or step on a horn projecting beneath the rudder. "Now according to my invention I give additional support to "the spindle of a balanced rudder, and I relieve the strain on "the step or lower bearing thereof by introducing a bearing "or bearings intermediate of those above mentioned as here- "tofore employed; in this way I form an intermediate bearing "midway or thereabout of the height of the rudder, and for "this purpose I cut away the rudder at the point where the "centre bearing comes from its leading edge back as far as "the spindle, and in this way room is obtained for the bear- "ing, which is carried on a horn or projection forged or "formed on a rudder post. I also introduce an intermediate "bearing just over the top of the rudder, and this bearing is "carried in the same way by a horn or projection forged or "formed on the rudder post. In most cases I employ both "these intermediate bearings, but in vessels of shallow draft "one of them may be omitted."

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 29.—N° 1497.

BOYMAN, RICHARD BOYMAN. —"Propelling vessels by the "reaction of water."

A method of hydro-propulsion is set forth at considerable length, a large number of mathematical calculations being given, and the history of the subject fully discussed. The propulsion is effected by jets of water issuing through pipes *fixed at* the sides of the vessel, and set in motion by suitable *engines*. Steering is effected by means of a sliding valve over

each orifice, or a rudder on a vertical shaft hung so as to close and open the outlet as required, or preferably by having separate engines to work the jets at the different sides, and regulating the power and direction of the jets according to the course to be steered."

[Printed, 3*s*. 2*d*. Drawings.]

A.D. 1866, May 29.—N° 1498.

HEWITT, FRANCIS.—Rudders.

The rudder and rudder-stock are of iron, both forged in one piece, and the stern-post is of like metal, forged with sockets or "gripping jaws" slotted to allow the rudder-blade to pass down them while they hold the stock. To allow the rudder the necessary play, the blade is cut away by the stock where the jaws come. Below the rudder is pivotted on a spur from the keel and generally two pair of the jaws are sufficient for its support, one pair just above the blade, and the other mid-way down it. Where they are placed, the rudder-stock may be enlarged to allow for wear. They "may be enlarged "at their sides so as to form a vertical angular-sided recess "having a convex bottom in which that portion of the blade "of the rudder moves." The stern-post is preferably slightly grooved to receive the rudder-stock. "Clutch pieces or stops "can be applied to the under side of the boss of the lever at "the rudder-head, or a circular boss may be keyed on to the "main piece near the head thereof, one side of which is "recessed, and in which recess is placed a vertical stop which "prevents the rudder being moved beyond the limit of the "recess." The rudder case is made with a passage to permit the blade to be passed down it, and a pair of flat plates close down over it and round the rudder-head. Or the upper part of the stock may be separate from the lower part, and fit thereon with a socket joint. The invention may be applied to wooden or composite vessels by using "broader and extra "gripping jaws" bolted to the stern-post and dead-wood.

[Printed, 8*d*. Drawing.]

A.D. 1866, May 30.—N° 1509.

EVELYN, GEORGE PALMER.—"A new or improved apparatus "for propelling boats and vessels."

A lever works vertically on a hinge at the stern of the vessel. To the lever is pivotted a blade or paddle. The end of the lever is forked, and the prongs, between which the paddle is hinged, regulate the angle at which the paddle is worked. The same method may be applied horizontally. The joint where the lever passes through the stern is made water-tight by an india-rubber tube or otherwise. The lever is worked by manual power or otherwise.

In large vessels a rod slides vertically in guides and has a reciprocating motion given it from an engine. To this rod the paddle is hinged. Springs are applied to ease the shock when the paddle is reversed. The guide and post which carries the propelling apparatus may turn in bearings at top and bottom, and be geared to a steering wheel by which it can be turned as a rudder. It may form a rudder when the propeller is out of use or may steer the vessel by directing the line of action of the propeller.

[Printed, 10*d*. Drawing.]

A.D. 1866, June, 22.—N° 1666.

PARKER, JAMES.—Propelling vessels, &c.

A vessel is propelled by jets of water produced by the direct action of steam admitted intermittently to tanks communicating with the water and fitted with valves so they may be alternately filled and have the water discharged from them. Tanks are placed at the bows and stern, and for the purposes of manœuvring the vessel there are "passages governed by valves "from the stern and bow tanks through the sides of the "vessel."

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 5.—N° 1783.

NEWTON, ALFRED VINCENT. — (*A communication from Robert Creuzbaur.*)—(*Provisional protection only.*)—"Steering apparatus."

A steering screw works in a tube "passing through the "hull" either at the forward or rear part thereof so as to be "out of the way of injury" "and so as to act and react upon "*the water in* a direction which is transversely or obliquely "*to the length* of the vessel." The screw is driven from a

vertical shaft turned by a capstan on each deck or by a small engine, a lever and sliding clutch being in the latter case used for throwing the screw shaft out of and into gear. The ends of the tube may be closed when required by external caps or internal sliding gates, so that it can be emptied of water. There may be gratings at the ends.

[Printed, 4*d*. No Drawings.]

A.D. 1866, July 12.—N° 1833.

GALLAFENT, DANIEL.—(*Provisional protection only.*)—Transmitting motion to ships' rudders.

The following is the whole of the Provisional Specification :—

" From the rudder-head I either extend an arm having a " groove in it in which a slide moves, or I fit such radial arm " to move through the head of the rudder, to which it is " accurately fitted; this sliding radial arm, or the slide " moving in the groove thereof, I connect by a pin or stud " with the short end of a lever forming the tiller, disposed " immediately above the rudder-head, the fulcrum of the " said lever tiller being disposed so that the connecting pin " or stud comes very near the rudder-head when the rudder " is in line with the keel, consequently the leverage of the " sliding radial arm is very slight at the time, while on the " tiller being moved a-port or starboard the radial arm is " extended and the leverage thereof increased according to the " greater extent to which the tiller is moved to port or starboard, " and as is required to overcome the resistance of the rudder. " The tiller mentioned may be actuated directly by hand or " by chains from a steering wheel as usual. The extending " radial arm from the rudder-head, or the slide moving therein " before mentioned, may move in chases or guides across the " breadth of the ship, and so be extended or move further " from the rudder-head, the leverage being increased the " further it is traversed in either direction from the middle of " the ship; when so fitted I connect the part sliding in the " chase across the breadth of the ship by chains to the barrel " on the steering wheel axle, which chains are led thereto over " pulleys as usual."

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 15.—N° 2091.

DE RUSETT, EDWIN WILLIAM, and DALE, RICHARD FARRELL.—"Improvements in pumps, and in adapting them "for propelling vessels."

A pump of special construction is described, which may be used for propelling vessels by drawing in a stream of water at the bows, and ejecting it at the stern, through tubes fore and aft of the vessel. For backing and steering there is an arrangement of valves by which the pump on either side can be made to draw either from the tube leading to the bows, or from that leading to the stern. This is effected by shifting a frame in which the valves are fixed without affecting the motion of the engines.

[Printed, 2s. Drawings.]

A.D. 1866, August 16.—N° 2104.

CLARK, WILLIAM. — (*A communication from William Lyman Wetmore and Nicholas David Le Pelley.*) — Rudders.

This invention consists in "constructing a rudder with two "or more blades arranged in such a manner that a plurality "of surfaces will be presented to the water." Two rudder-blades are attached to the rudder-post "parallel with each "other with a space between them; these blades may be "stayed and braced by a horizontal partition plate, and the "inner part of each blade is hollowed out to form openings "adjoining the rudder post. Valves are connected by joints "or hinges to the rudder post, one valve being above, and "the other below the stay or partition plate; these valves are "allowed to swing or work freely on their hinges, and close, "under certain circumstances, the openings." "The rear of "the space between the blades is open, and when the rudder "is turned for the purpose of steering the vessel, the valves, "owing to the resistance or action of the water, will close "the opening of the blade which is at the rear of the one "against which the water first acts, the openings of the latter "blade being open, and the water consequently will rush "*through* the said openings and through the spaces between "*the blades*, and consequently will act on the exterior of one

" blade and the interior of the other, forming two steering " surfaces, while the passage of the water between the blades " will, as it leaves the said space, react upon the water at the " rear of the rudder in such a manner as to have a tendency " to force the stern of the vessel in the direction given it by " the rudder; the valve openings at the inner parts of the " blades may be covered with wires to form a screen, and " prevent drift wood from passing through to clog and render " inoperative the valves."

[Printed, 8*d*. No Drawings.]

A.D. 1866, August 22.—N° 2157.

CARTER, GEORGE.—Propelling vessels.

A jet of "a mixture of air and water" is driven from a pipe projecting over the bows, and curved down towards the surface of the water. It is stated that the air thus driven down will pass under the vessel's hull, and along channels suitably formed therein, to the stern and propel the vessel. Steering may be effected by having three such pipes, one on each side of the bows, with valves, or there may be a "moveable stern," apparently a block of suitable shape pivotted below the stern, and capable of being turned from side to side by a handle. It is also capable of a vertical motion to assist in some way not explained the direction of the stream of air.

Reference is made to No. 1178, A.D. 1856.

[Printed, 8*d*. Drawing.]

A.D. 1866, August 30.—N° 2237.

CLARK, WILLIAM.—(*A communication from Joseph Athanase Ganeval.*)—"Propelling and steering vessels."

The frame enclosing the propeller is "open at the rear." It consists of "several blades of similar dimensions disposed " one behind the other" "obliquely on the shaft." The propeller may be enclosed in a "cylindrical caging." Tubes may pass from the fore part of the vessel to the opening in which the propeller works to supply it with water. These tubes pass from either side of the vessel, and it may be steered by closing either of them. The propeller can be fitted to any vessel instead of the screw by removing the rudder. To steer the vessel, two small propellers working on a transverse shaft

re used. Motion is communicated to them by gearing on the main shaft, and they can by means of levers and clutches be at once thrown into or out of gear with the main shaft. They both act together, and turn in the same direction at once, so that both act on the vessel at the same time.

[Printed, 1s. Drawings.]

A.D. 1866, September 10.—N° 2327.

CURTIS, WILLIAM JOSEPH.—"Steering steam vessels."

The first of the invention relates to improvements on No. 1782, A.D. 1862, a method of steering a vessel by the screw.

According to the present invention the screw shaft has upon it a special description of universal joint, so that the screw can be turned in any direction required to steer the vessel. The after end of the propeller shaft is received by a "swing-" ing stern post" pivotted below on a spur from the keel, and fitted above with a shaft which is actuated by any suitable steering apparatus. By means of a bolt this stern-post can be fixed so that the screw cannot be turned for steering purposes. Attached in the usual way to the "swinging stern-" post" is a rudder. The shaft of this rudder is connected by a link to a collar on the shaft on the stern-post, and this is fixed by a "double crank or saddle" to a shaft which passes up through the shaft (which is hollow) of the stern-post. On the top of this shaft steering apparatus may be attached, which may be used when the stern-post is fixed to steer the vessel in the ordinary way. The shafts of the rudder and stern-post may be connected by means of a pin, and both rudder and screw used for steering, when the rudder comes over to an angle with the stern-post, and assists in turning the vessel. Also the ship may be steered by the screw alone, and then, the shafts being disconnected, the rudder is allowed to trail in the wake of the ship.

The above steering apparatus may be actuated by the propelling engine. The propeller shaft drives a vertical shaft by bevelled gearing, and this in a similar way drives another horizontal shaft in a line with the rudder-head. By means of a clutch on this shaft gearing alternately with one of two *opposite* bevel wheels, motion in either direction is imparted *to the shaft*, and it by a worm and worm-wheel drives a wheel

embracing a friction wheel on the shaft of the before-mentioned "swinging stern-post." The object of the friction wheel is to allow the rudder to give way when struck by a sea. To steer by hand the worm and worm wheel may be thrown out of gear. When the ship is under sail, the main shaft may be disconnected from the engine, when the motion of the ship through the water will rotate the screw and its shaft, and thus supply power for working the rudder.

[Printed, 10*d*. Drawing.]

A.D. 1866, September 24.—N° 2456.

NEWTON, ALFRED VINCENT. — (*A communication from Robert Creuzbaur.*)—"Steering vessels."

The invention relates to methods of steering a vessel by means of a screw rotating in a tube passing transversely across the ship. This may be effected by steam power or manual power. In the latter case a vertical shaft is revolved by capstans on both decks, and by means of a sliding clutch and a lever motion in either direction may be imparted to the screw while the shaft revolves always in the same direction. The lever operating the clutch passes up through both decks so that it can be worked from either.

When steam is used, a lever attached to the connecting rod operating the slide valves carries the end of the rod from one end to the other of a rocking lever to one end of which motion is given from an eccentric as usual. By this the working of the slide valves, and consequently the action of the engine is at once reversed.

Instead of the tube being straight, it may be curved, so as to allow one or both ends of the screw shaft to pass through the curved sides of the tubes and therefore permit the journals to be accessible from the interior of the vessel for oiling, &c. Otherwise the shaft is supported in bearings by cross-pieces.

The end of the tubes are "flaring;" they may be fitted with caps or gates so that the tube can be closed to be emptied when required; the ends are also fitted with gratings.

The screw may be used instead of, or as an auxiliary to the rudder.

[Printed, 1*s*. Drawings.]

A.D. 1866, September 26.—N° 2489.

OULTON, MATTHEW PIERS WATT.—(*Provisional protection only.*)—"Apparatus for employing the motive power of jets of fluid."

This invention may be used for the purpose of propelling vessels. The vessel "carries with it a vessel in which aeriform "fluid is generated or contained under pressure, and a jet of "fluid issues from a nozzle or orifice communicating with "this vessel; this jet issues into the water at the hinder part "of the vessel in the direction in which it is desired to impel "the vessel, or nearly in that direction, and produces a cur- "rent of water also moving in like direction. The current "thus produced impinges on a curved surface, or flows "through a curved channel attached to the ship or vessel "which it is desired to propel. It may be deflected by this "surface through various angles, but it is best that it should "be so deflected as to be turned backward, so as to quit the "surface in a direction contrary to that which it had before "impinging on the surface." "The current before impinging on the deflecting surface may pass through a passage or "passages in which its velocity is reduced and a portion of "its vis viva converted into pressure or potential energy, so "that it may act on the surface partly by pressure and partly "by vis viva, as takes place in a turbine." The jet may be steam "or other aeriform matter." The direction of the ship may be controlled by altering the directions of the jets, and the position of the "deflecting surfaces."

[Printed, 4*d*. No Drawings.]

A.D. 1866, September 29.—N° 2521.

CLARK, WILLIAM.—(*A communication from Maurice Aron.*)—"Steering vessels."

A small auxiliary screw is fitted in a line with the keel either above or below the main propeller between it and the stern-post. Its shaft is geared with the main propeller shaft. On the shaft is a universal joint, and its end passes out through a slit in the stern fitted with a sliding plate packed with india-rubber to keep it water-tight. The stern post is formed with

an opening of the same shape as the slit, and has a metal frame to strengthen it at the spot. To turn the screw so as to steer the vessel there may be a rack on the sliding plate and a pinion, turned by a shaft from the deck, or a vertical shaft may have a crank formed on its lower end, the pin of which is attached to the moveable part of the screw shaft, so that by rotating the shaft the crank, and with it the screw, may be turned to one side or the other.

As a modification of the above arrangement the steering screw may be mounted in a frame in the dead-wood before the stern-post, and the gearing for working it may be contained in a water-tight compartment from which the shafts above described pass out through stuffing boxes into the interior of the vessel.

The steering screw is to be arranged so that it can be readily disconnected from the main propeller, and operated by hand if required.

[Printed, 1s. Drawing.]

A.D. 1866, October 22.—N° 2723.

KIRK, ALEXANDER CARNEGIE.—(*Provisional protection only.*) —"Steam dredgers."

The following is the entire Provisional Specification :— "This invention has principally for its object to render "steam dredgers capable of being more easily manœuvred "than hitherto ; and it consists in employing for that purpose "centrifugal or other pumping apparatus to be worked by the "main or separate engines, and to cause the projection by "suitable passages or orifices at the stern of one or more "streams of water. When the dredger is formed with one or "more wells for the endless chain or chains of dredging "buckets, the inlet opening or openings for the access of "water to the pumping apparatus is or are situated at the "after end of such well or wells, but when the dredger has "the buckets at the sides, the inlet opening is placed at the "bow or forward part. As it is of great importance to have "the power of turning and generally manœuvring such vessels "independently of the tug usually in attendance, deflectors "or rudders are attached to the stern orifices through which "the water is projected, whilst to permit of reversing the

" direction of propulsion, either rotatory reversable pumps " are used, or reversing valves are fitted to the water passages " communicating with the pumping apparatus."

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 22.—N° 2724.

JOHNSON, JOHN HENRY.—(*A communication from John Stanworth Martin and John Frederick Droop.*)—(*Provisional protection only.*)—" Propelling and steering ships and " vessels."

" This invention consists in the application to the propelling " and steering of ships and vessels of the principle involved " in injecting water into steam boilers by the aid of what is " known as the 'injector,' viz., the conducting of steam into " a pipe having a tapering discharge end, so that it discharges " the steam with great power into the cold water, which con- " denses it and which produces a vacuum, into which the " surrounding water flows, and thus when applied according " to this invention the steam from an ordinary boiler is made " to act directly on the water," it is proposed to fix in any convenient part of the "keel or bottom of the vessel, or to " attach thereto an apparatus constructed on the principle " before referred to, which is connected to the boiler by a pipe " for the purpose of conducting the steam into such apparatus. " The extremity or discharge point of the apparatus is con- " ducted inside one end of a pipe which has its other end " open to the water in which the vessel floats. Into this " apparatus a stream of water is conducted which is forced " out by the action of the steam jet, and acting against the " water in the last mentioned pipe (and by it against the water " in which the vessel is floating), causes the vessel to be pro- " pelled in an opposite direction; this water may be caused " to pass from either the sides, stem, stern, or any other part " of the vessel, and through one or more pipes or tubes con- " veniently disposed so as to afford facility for steering or " manœuvring the vessel." There may be more than one apparatus in the vessel, and its position may be varied.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 30.—N° 2809.

BOULTON, MATTHEW PIERS WATT.—(*Provisional protection only.*)—"Employing the motive power of jets of fluid."

Within the vessel is a "vessel in which æriform fluid is "generated or contained under pressure." A jet of this fluid issues from an orifice "into water supplied from the water "outside the ship" "and sets in motion a current of water." "The current thus produced impinges on a curved surface or "flows through a curved channel by which it is deflected." The current before being deflected may pass through a passage "in which its velocity is reduced and a portion of its vis viva "converted into pressure or potential energy." The current may be discharged into the water or the air, and its reaction propels the vessel. "The jet of æriform fluid" which may be steam, &c., "may issue in a direction transverse to the "major axis or length of the vessel" or in other directions. A number of jets may be used at different parts of the ship. "The direction of the ship's motion may be controlled by "changing the direction and action of the jets and the direction "of the issuing currents."

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 6.—N° 3219.

PHIPPS, GEORGE HENRY.—(*Provisional protection only.*)—"Propelling, steering, and manœuvring vessels, ships, boats, "and other navigable bodies."

The invention "consists in the combination in one and the "same vessel or navigable body of two distinct systems of "propulsion, one of which is the known system under which "water is continually taken into and ejected from the interior "of the vessel," which is termed "the emissive system, while "the other system may be either that of the screw propeller "or that of the paddle wheel."

"The emissive system employed, as also the construction "of the screw propeller or paddle wheel, and the respective "machinery for working the same may be of any known "arrangement." The "emissive system may be used for "steering," either instead of, or as auxiliary to the rudder.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 7.—N° 3233.

SAMUELSON, CARL ERIK. — (*A communication from Samuel Arnold Samuelson.*)—Propelling vessels.

Steam is discharged into a chamber communicating with a tube which opens to the bottom of the vessel and then passes aft, where it is forked, and the two ends discharge one on each side of the stern. There are also tubes from the main tube, which curve round and discharge towards the bows. All these are furnished with valves, by the use of which the vessel can be steered.

[Printed, 10*d*. Drawing.]

A.D. 1866, December 13.—N° 3276.

GRELL, JOHANN HEINRICH.—Keels and rudders.

Openings are made in the keel, in which openings rudders are fixed, one in each space. These rudders are fixed on vertical spindles which are worked by gearing from a horizontal shaft running along the length of the vessel and driven by hydraulic, steam, or other power. In the drawings the rudders are shown of various sizes according to the depth of the keel, and near the midship section there do not appear to be any. They are wedge-shaped in their vertical section, and are pivotted on their spindles at a point about equidistant from both ends.

[Printed, 10*d*. Drawings.]

A.D. 1866, December 15.—N° 3295.

RANDOLPH, CHARLES.—"Improvements in apparatus for "propelling vessels."

The invention relates to the propelling of vessels by means of centrifugal fans or pumps, "each fan being in a casing, in "communication with which there are two passages or ducts "leading one to the bow and the other to the stern of the "vessel." The fan shaft is driven always in one direction by any suitable steam engine, the direction in which the water is propelled along the ducts being altered by changing the position of the fan in the casing. "There is in the casing a diaphragm "or partition, the inner edge of which is just cleared by the

" fan, and the ducts or passages communicating with the bow " and stern respectively, open into the circumferential parts " of the casing on the opposite sides of the diaphragm. The " fan is shifted by moving its shaft in the direction of its axis; " and when the fan has its circumferential openings to that " side of the diaphragm which is in communication with the " stern duct or passage, the water will be forced out by that " duct and drawn in by the other, and the vessel will be " propelled ahead. When the fan is shifted to the other side " of the diaphragm the action will be reversed, whilst if the " fan is in its middle position, the water will move in circles " by the eye and circumference on each side, and the ship " will not be propelled in either direction." "The fan has " an open central eye on each face, but the movement which " brings the circumferential openings to one side of the " diaphragm in the casing, causes the eye of that face to be " closed against the side of the casing, whilst the eye of the " other face is drawn away from the other side of the casing, " and the water has thus free access by it into the fan." The water-ways may lie along the central line of the vessel, and " deflecting plates " for steering may be fitted at their ends; or they may lie along the sides, and the steering be effected by altering the direction of the jets.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, December 18.—N° 3321.

GRAY, JOHN MCFARLANE.—Steering apparatus, telegraph, and indicator.

The invention comprises two parts, first, a steering telegraph and indicator, and, second, a steam steering engine.

1. A line of shafting is carried from the bridge to "a tele- " graph placed across the helm." At this point is a vertical screwed shaft, in gear with the line of shafting from the bridge, and working through a nut in the axis of a wheel, which is held between collars so as to have no vertical motion. This wheel is driven from the steering-wheel shaft. The screwed shaft has two "stop clutches," one on each side of the nut, which catch into corresponding projections on the nut when the shaft has moved through a distance of about "one turn of " the screw each way, or two turns altogether." These pro-

jections are "stops to the motion of the screwed shaft when "that motion has been imparted by working the wheel at the "bridge, and they are driven to communicate the motion of "the steering wheel shaft to the screwed shaft and telegraph "shafting." "The screwed shaft carries a piece containing a "turned groove, and a sliding block lies in this groove." A pin in this block is attached to a lever, so that the longitudinal motion of the screwed shaft actuates the lever, and controls the slide valves of the steering engine, so as to bring it into action as required. On the screwed shaft is a pinion, on the nut is also a pinion, these work two index hands on a dial plate, of which one represents the position of the rudder, the other the position it is required to be put into. The apparatus at the bridge for working the telegraph consists of an ordinary steering wheel gearing to the line of shafting above mentioned. There is also an index hand worked from the shafting. The wheel is attached to the shafting through the medium of a safety clutch. The effect of the arrangement is that any motion of the rudder causes a corresponding motion of the wheel on the bridge, and of both indicators, that on the bridge, and that worked from the rudder near the steering wheel, while the man on the bridge can move his wheel and the corresponding indicators, so as to signal the steersman without affecting the rudder.

There are also two modifications of the apparatus; in one motion is transmitted from the wheel on the bridge by hydraulic apparatus; in the other by a chain, &c. The wheel works a pair of rams in hydraulic cylinders, each cylinder being in communication with a cylinder near the rudder containing a corresponding ram. By these the engine slide valves are operated, and the steering indicator worked. Or a pair of chains are attached one to each end of a screwed rod working through a nut as in the first arrangement.

There is also an arrangement for signalling the steersman by a bell. This, as well as the portion of the above described apparatus which refers to signalling, hardly come within the scope of the series. As, however, the portion intended for signalling, and that intended for indicating the position of the rudder, are so closely connected, it has seemed needful to give the description in brief of the whole.

2. The steering engine has two cylinders; it is connected, *as above stated*, with the shafting from the bridge, so as to be

controlled therefrom. A pinion on the engine shaft gears into a wheel on the steering shaft so that the former may rotate faster than the latter, and thereby act at an advantage. The engine can be thrown out of gear with the steering apparatus so that the hand wheels can be used when required.

[Printed, 2s. 8d. Drawings.]

A.D. 1866, December 20.—N° 3357.

LUNGLEY, CHARLES.—Ship-building.

Various improvements in armour-plated vessels are described. The following passage contains the portion referring to the present series :—"Where I fit a balanced or other form "of rudder to work without the ordinary pintles and braces, "I make a slot in the keel or in the part giving support to "the rudder. I fit a stop or T pintle with a joggle to work "under the reel or supporting piece ; to ship this into place "I put the rudder out of position and drop the T piece and "pintle through the slot, and when the rudder is put into "proper position the T piece is across the slot and works "under the supporting part and keeps the rudder from un- "shipping ; in this case I make the pintle large and cover it "with wood or metal to keep it from wearing away ; I also "fit to the rudder post pins to keep it from working over too "far ; in some cases I fit these rudders, or part of them with "elastic material fitted in a groove with projecting arms as "a guide, and rods and pulleys with chains to lead inboard or "up to the rudder post so as to act upon the after part of the "rudder ; in this case I make the after part of the rudder "thicker."

[Printed, 1s. Drawings.]

A.D. 1866, December 28.—N° 3402.

FRANZEN, NICOLAI CHRISTIAN.—"Steering indicator."

This consists of a dial-plate set vertically, through the centre of which passes a spindle carrying an index finger. This pointer and the dial are of different colours, so as to show distinctly. The spindle is driven by gearing from the rudder, so that the pointer represents the position of the rudder. The arc in which it travels consists of the upper half of the dial

plate, and the lower half is transparent and illuminated to serve as an indicator at night. For this purpose an opaque plate fits on the same spindle which carries the index, and has cut in it an opening of the same shape as the index. The slit thus illuminated serves the same purpose as the index. To render the signals more distinct the transparent plate is divided radially into compartments of different colours, so that the different positions of the rudder are shown by distinct colours as well as by the various positions of the illuminated slit.

[Printed, 8*d*. Drawing.]

INDEX OF SUBJECT MATTER.

[The numbers refer to the pages on which the Abridgments commence. The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

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Chichester (*Literary Society and Mechanics' Institute*).
Chippenham (*Literary and Scientific Institution*).
Christchurch (*Working Man's Institute*).
Clevedon (*Village Hall Institution for Working Men*).
Cockermouth (*Mechanics' Institution*).
Coggeshall (*Literary and Mechanics' Institution*).
Colchester (*Literary Institution*).
——— (*Young Men's Christian Association*).
Compstall (*Athenæum*).
Coventry (*Free Library*).
——— (*Institute*).
——— (*School of Art*).
Crediton (*Working Men's Club*).
Crewe (*Mechanics' Institution*).
Dartmouth (*Mutual Improvement Society*).
Deal (*Deal and Walmer Institute*).
Denton (*Denton and Haughton Mechanics' Institution*).
Derby (*Mechanics' Institution*).
Devonport (*Mechanics' Institute*).
Dewsbury (*Mechanics' Institution*).
Diss (*Reading Room and Library*).
Doncaster (*Free Library*).
——— (*Great Northern Mechanics' Institute*).
——— (*Young Men's Christian Association*).
Dorchester (*County Museum and Library*).
——— (*Working Men's Institute*).
Dudley (*Mechanics' Institution*).
Dukinfield (*Village Library and Reading Room*).

Dumbarton (*Philosophical and Literary Society*).
Dumfries (*Mechanics' Institution*).
Dundee (*Young Men's Christian Association and Literary Institution*).
Durham (*Mechanics' Institute*).
Eagley, Bolton-le-Moors (*Library and Institute*).
Ealing (*Mechanics' Institute*).
East Greenwich (*Working Men's Institute*).
East Retford (*Literary and Mutual Improvement Society*).
Earlestown, Newton-le-Willows (*Mutual Improvement Society*).
Ebbw Vale (*Literary and Scientific Institute*).
Edinburgh (*Philosophical Institution*).
——— (*Royal Scottish Society of Arts*).
——— (*Subscription Library*).
——— (*Watt Institution and School of Art*).
——— (*Working Men's Club*).
Egham (*Literary Institute*).
Egremont (*Mechanics' Institute*).
——— (*Workmen's Institute*).
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——— (*Devon and Exeter Institution*).
Farnham (*Young Men's Association*).
Faversham (*Institute*).
Fowey (*Working Men's Reading Rooms*).
Frome (*Literary and Scientific Institution*).
——— (*Mechanics' Institution*).
Gainsborough (*Literary, Scientific and Mechanics' Institute*).
Garforth, near Leeds (*Working Men's Club*).
Glasgow (*Athenæum*).
——— (*Central Working Men's Club and Institute*).
——— (*Institution of Engineers in Scotland*).
——— (*Mechanics' Institution, Bath Street*).
——— (*Philosophical Society*).
Glastonbury (*Literary Institute*).
Godmanchester (*Working Men's Reading Room*).
Gosport (*Gosport and Alverstoke Literary and Scientific Institution*).
Grantham (*Public Literary Institution*).
Gravesend (*Gravesend and Milton Library and Reading Rooms*).
Guernsey (*Mechanics' Institution and Literary Society*).
——— ——— (*Working Men's Association*).
Guildford (*Working Men's Institution*).
Hadleigh (*The Reading Room*).
Halesworth (*Mechanics' Institute*).
Halifax (*Literary and Philosophical Society*).
——— (*Mechanics' Institute*).
——— (*Working Men's College*).
Halstead (*Literary and Mechanics Institute*).
Haslingdon (*Institute*).
Hastings (*Literary and Scientific Institute*).
——— (*Mechanics' Institution*).
Hawarden (*Literary Institution*).
Hebden Bridge, near Todmorden (*Mechanics' Institution*).
Helston (*Reading Room and Library*).
Hemel Hempsted (*Mechanics' Institute*).
Hereford (*Natural History, Philosophical, Antiquarian, and Literary Society*).
Hertford (*Literary and Scientific Institution*).
Heywood (*Mechanics' Institute*).
Hitchin (*Mechanics' Institute*).
Holbeck (*Mechanics' Institution*).
Hollingwood (*Working Men's Club*).
Holt, Norfolk (*Literary Society*).
Holywell Green (*Mechanics' Institution*).
Horncastle (*Mechanics' Institution*).
Huddersfield (*Mechanics' Institution*).
Hull (*Church Institute*).
—— (*Literary, Scientific, and Mechanics' Institute*).
—— (*Lyceum Library*).
—— (*Royal Institution, Albion Street*).
—— (*Young People's Institute*).
Huntingdon (*Literary and Scientific Institution*).
Ipswich (*Working Men's College*).
Kendal (*Christian and Literary Institute*).
——— (*Highgate Mechanics' Institute*).
——— (*Working Men's Institute*).
Kidderminster (*Mechanics' Institute*).
Lancaster (*Mechanics' Institute and School of Science*).
Lee, Kent (*Working Men's Institution*).
Leeds (*Chapeltown Branch Library*).
—— (*Church Institute*).
—— (*Holbeck Branch Library*).
—— (*Hunslet Branch Library*).
—— (*Leeds Library*).
—— (*Mechanics' Institution and Literary Society*).
——— (*Philosophical and Literary Society*).
——— (*Working Men's Institute*).
——— (*Young Men's Christian Association*).
Leek, Staffordshire (*Literary and Mechanics' Institution*).
Leicester (*Law Society*).
——— (*Young Men's Christian Association*).
Leighton Buzzard (*Working Men's Mutual Improvement Society*).
Leith (*Mechanics' Subscription Library*).
Lewes (*Fitzroy Memorial Library*).
——— (*Mechanics' Institute*).
——— (*School of Science and Art*).
Lincoln (*Mechanics' Institute*).

Liverpool (*Institute*).
——— (*Medical Institution*)
——— (*Polytechnic Society*).
Llanelly (*Chamber of Commerce and Reading Room*).
Lockwood (*Mechanics' Institution*).
London (*Albert Working Men's Club, Knightsbridge*).
——— (*Bank of England Library and Literary Association*).
——— (*Beaumont Institute, Mile End*).
——— (*Bedford Working Men's Institute, Spitalfields*).
——— (*Birkbeck Institution, Southampton Buildings, Chancery Lane*).
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——— (*Clerkenwell Club, Lower Rosoman Street*).
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——— (*Literary and Scientific Institution, Walworth*).
——— (*London Association of Foremen Engineers and Draughtsmen*).
——— (*London Library, St. James'*).
——— (*St. James and Soho Working Men's Club, Rupert Street, Soho*).
——— (*St. Mary Charterhouse Working Men's Club, Golden Lane*).
——— (*South London Working Men's College, Blackfriars Road*).
——— (*Southwark Working Men's Club, Broadwall, Stamford Street*).
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——— (*Working Men's Club and Institute Union, Strand*).
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Longwood (*Mechanics' Institution*).
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Lye (*Institution*).
Lymington (*Literary Institute*).
Madeley, Shropshire (*Anstice Memorial, Workmen's Club and Institute*).
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——— *Working Men's Club and Institute.*)
Maldon, Essex (*Literary and Mechanics' Institute*).
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——— (*Athenæum*).
——— (*Campfield Free Lending Library*).
Manchester (*Cheetham Branch Library*).
——— (*Chorlton and Ardwick Branch Free Library*).
——— (*Hulme Branch Free Library*).
——— (*Law Library*).
——— (*Mechanics' Institution*).
——— (*Natural History Museum, Peter Street*).
——— (*Owen's College*).
——— (*Portico Library, Mosley Street*).
——— (*Rochdale Road Branch Free Library*).
——— (*Royal Exchange Library*).
——— (*Scientific and Mechanical Society*)
Mansfield (*Co-operative Industrial Society*).
——— (*Mechanics', Artizans', and Apprentices' Library*).
——— (*Mechanics' Institute*).
Marlborough (*Reading and Mutual Improvement Society*).
——— (*Working Men's Hall*).
Melksham (*Mutual Improvement Society*).
Melton Mowbray (*Literary Institute*).
Mere, near Bath (*Literary Association*).
Middlesborough (*Iron and Steel Institute*).
——— (*Mechanics' Institution*).
Middlewich (*Literary and Scientific Institution*).
Modbury (*Mechanics' Institution*).
Mossley (*Mechanics' Institute*).
Newark (*Mechanics' Institute*).
Newbury (*Literary and Scientific Institution*).
Newcastle-upon-Tyne (*Mechanics' Institution*).
——— (*Working Men's Club*).
New Mills, near Stockport (*Mechanics' Institute*).
Newport, Isle of Wight (*Young Men's Society and Reading Room*).
Northampton (*Mechanics' Institute*).
North Shields (*Free Library*).
Nottingham (*Mechanics' Institution*).
——— (*Subscription Library, Bromley House*).
Odiham (*Mechanics' Institution*).
Oldham (*Analytic Literary Institution*).
——— (*Mechanics' Institution, Wernetli*).
Ormskirk (*Public Library*).
Oswestry (*Institute*).
Over, Cheshire (*Working Men's Institute*).
Oxford (*North Oxford Working Men's Club*).
Patricroft (*Mechanics' Institution*).
Pembroke Dock (*Mechanics' Institute*).
Pendleton (*Mechanics' Institution*).

Penzance (*Institute.*).
——— (*Penzance Library*).
——— (*Working Men's Association*).
Perth (*Mechanics' Library, High Street*).
Peterborough (*Mechanics' Institution*).
Plymouth (*Working Men's Institute*).
Pontypool (*Literary Institute*).
Poole (*Literary and Scientific Institution*).
——— (*Mechanics' Institute*).
Port Glasgow (*Public Library*).
Portsea Island (*Young Men's Christian Association*).
Preston (*Institution for the Diffusion of Knowledge*).
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Royston (*Institute*).
Rusholme (*Public Hall and Library*).
Ryde, Isle of Wight (*Philosophical and Scientific Society*).
——— (*Young Men's Christian Association and Literary Institute*).
Saffron Walden (*Literary and Scientific Institution*).
St. Just (*Institution*).
St. Leonards (*Mechanics' Institution*).
——— (*Working Men's Club*).
Salford (*Working Men's Club*).
Salisbury (*Literary and Scientific Institution*).
Saltaire (*Literary Institute*).
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Shaftesbury (*Literary Institution*).
Sheerness (*Literary Institute*).
Sheffield (*Branch Free Library*).
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——— (*Mechanics' Institution*).
Shepton Mallet (*Reading and Mutual Improvement Society*).
Sidmouth (*Mechanics' Hall*).
Skipton, Yorkshire (*Mechanics' Institute*).
Slough (*Mechanics' Institute*).
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Southport (*Athenæum*).
South Shields (*Public Free Library*).
Southwell (*Literary Institution*).
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Staines (*Literary and Scientific Institution*).
Staines (*Mechanics' Institute and Reading Room*).
Stalybridge, Cheshire (*Mechanics' Institution*).
Stamford (*Institution*).
Stourbridge (*Associated Institute*).
——— (*Church of England Association*).
——— (*Iron Works Reading Room and Library*).
——— (*Mechanics' Institution*).
——— (*Working Men's Institute*).
Stowmarket (*Literary Institution*).
Stratford (*Working Men's Hall*).
Sudbury, Suffolk (*Literary and Mechanics' Institute*).
Sunderland (*Working Men's Club*).
Swansea (*Royal Institution of South Wales*).
——— *South Wales Institute of Engineers.*
——— (*Working Man's Institute*).
Tavistock (*Mechanics' Institute*).
——— (*Public Library*).
Thornton, near Bradford (*Mechanics' Institute*).
Thornton Heath, Croydon (*Workmen's Club*).
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Truro (*Cornwall County Library*).
——— (*Institution*).
——— (*Royal Institution of Cornwall*).
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——— (*Mechanics' Institute.*)
Tunbridge Wells (*Mechanics' Institution*).
——— (*Society of Literature and Science*).
Turton, near Bolton (*Chapel Town Institute*).
Tynemouth (*Free Public Library*).
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Uttoxeter (*Mechanics' Literary Institute*).
Uxbridge (*Uxbridge and Hillingdon Reading and Newsroom Institute*).
Wakefield (*Mechanics' Institute*).
Wallingford (*Free Library and Literary Institute*).
Walsall (*Free Library*).
Walsham-le-Willows, Suffolk (*Institute*).
Ware (*Institute*).
Warminster (*Athenæum*).
Watford (*Literary Institute*).
Wellingborough (*Working Men's Club*).
Wellington (*Young Men's Christian Association*).
Wells, Somerset (*Mechanics' Institution, Grove Lane*).
——— (*Young Men's Society*).
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Whaleybridge (*Mechanics' Institute*).
Whitby (*Institute*).
——— (*Museum*).
——— (*Subscription Library*).
Whitehaven (*Mechanics' Institute*).

Whitehaven (*Working Men's Reading Room*).
Whitstable (*Institute*).
Wilton (*Literary Institute*).
Winchester (*Mechanics' Institution*).
——— (*Training College*).
Winsford (*Town Hall Reading Room*).
Wirksworth (*Mechanics' Institution*).
Wisbeach (*Mechanics' Institute*).
Witham (*Literary Institution*).
Witney (*Athenæum*).
Wolverhampton (*Law Library*).
——— (*Library*).
Wolverton (*Institute*).
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——— (*Working Men's Hall*).
Worcester (*Railway Literary Institute*).
——— (*Workman's Hall*).
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